RAILROAD GAZETTE

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RAILROAD GAZETTE DIRECTORY: CLASSIFIED ADVERTISEMENTS.

Air Brake Fittings
Stanley G. Flagg & Co., Phila.

Air Brake Hose
N.Y. Belt. & Pack. Co.,15 Park Row, N.Y.
Peerless Rubber Co., 15 Warren St.

Air Brake Regulator
Mason Regulator Co., Boston.

Air Compressors & Rock Drills
Ingersoll-Sergeant Rock Drill Co., 10 Park Place, N. Y.
Rand Drill Co., 23 Park Place, N. Y.

Aluminum
Pittsburgh Reduction Co.

Architect
Bradford L. Gilbert, 50 Broadway, N. Y.
Thomas Appleton, 505 Rialto Bldg., Chic.

Architectural Iron Work
King Bridge Co., Cleveland, O.

Asbestos Packing
H. W. Johns Mfg. Co., N. Y. City.

Asphalt Pavement
Wehn Pavement Co., 16 Exch. Pl., N. Y.

Axles
Cambria Iron Co., Johnstown, Pa.
Lima Machine Works, Lima O.
Louisville Steam Forge Co., Louisv., Ky.
Michigan Car Co., Detroit, Mich.
Mich. Forge & Iron Co., Detroit, Mich.
Midvale Steel Co., Nicetown, Phila.
Pitts'gh Forge & Iron Co., Pittsb., Pa.
T. Prosser & Son, 15 Gold St., N. Y.

Balanced Slide-Valves
M. C. Hammett, Troy, N. Y.

Ballast Unloaders
Marion Steam Shovel Co., Marion, O.

Bankers
Brown Bros. & Co., 59 Wall street, N. Y

Bell Cord & Couplings
Samson Cordage Works, Boston, Mass.

Boilers
Abendroth & Root Mfg. Co., 28 Cliff St., N.Y.
Lidgerwood Mfg. Co., 96 Lib'ty St., N.Y.
Rich. Locc. & Mach. Co., Richmond, Va.

Boiler Plate
Schoenberger & Co., Pittsburgh, Pa.

Bolt Cutters
Acme Machinery Co., Cleveland O.
Howard Iron Works, Buffalo, N. Y.

Bolts & Nuts
Fuller Bros. & Co., 129 Gr'nwich St., N.Y.
Rhode Island Tool Co., Providence.

Books & Publications
E. & F. N. Spon & Co., 12 Cortl'd't St., N.Y.
John C. Trautwine, Jr.

Brake Adjusters
Q. & C. Co., Chicago.

Brake Beams
Nat. Hollow Brake Beam Co., Chic., Ill.
Northwestern Equipment Co., Chicago.
Schoen Mfg. Co., Pittsburgh.

Brakes
Boyden Brake Co., Baltimore, Md.
Westinghouse Air-Brake Co., Pittsb., Pa.

Brake-Shoes
Congdon Brake-Shoe Co., Chicago, Ill.
Ramapo (N. Y.) Wheel & Foundry Co.

Bridges
Anderson & Barr, Jersey City, N. J.
Berlin Iron Bridge Co., E. Berlin, Conn.
Boston Bridge Works, Boston, Mass.
Chicago Bridge & Iron Co., Chicago, Ill.
Cofrode & Saylor, Philadelphia, Pa.
Detroit Bridge & Iron Wks, Det., Mich.
Edge Moor Bridge Wks, Wilmington, Del.
Elmira Bridge Co., Elmira, N. Y.
S. W. Frescoln, World Bldg., N. Y.
Keystone Bridge Co., Pittsburgh, Pa.
King Bridge Co., Cleveland, O.
Louisville Bridge & Iron Co., Louisv., Ky.
Mo. Val. Br. & Ir. Wks., Leavenw., Kan.
Mt. Vernon Bridge Co., Mt. Vernon, O.
New Jersey Steel & Iron Co., Trenton.
Passaic Rolling Mill, Paterson, N. J.
Phœnixville Bridge Co., Phila., Pa.
Pittsburgh Bridge Co., 1105 Owings Bldg. Chicago.
Pottsville Bridge Co., Phila.
Rochester Bridge & Ir. W'ks, Rochester.
A. & P. Rober's & Co., Philadelphia, Pa.
San Francisco Bridge Co., California.
Shailer & Schniglau, Chicago, Ill.
Shiffler Bridge Co., Pittsburgh, Pa.
Sooysmith & Co., 7 Nassau street, N. Y.
Union Bridge Co., 18 Broadway, N. Y.
J. A. L. Waddell, Kansas City, Mo.
Wallis Iron Works, Jersey City, N. J.
Youngstown (Ohio) Bridge Co.

Bridge Machinery
Vulcan Iron Works, Chicago.

Bridge Timbers
Alexander McClure, Pittsburgh, Pa.

Buildings
Berlin Iron Bridge Co., E. Berlin, Conn.

Bulldozers
Williams, White & Co., Moline, Ill.

Cars
Allison Mfg. Co., Philadelphia, Pa.
Bloomsburg Car Co., Bloomsburg, Pa.
Osgood Bradley & Sons, Worcester, Mass.
J. G. Brill & Co., Philadelphia, Pa.
Reginald Canning & Co., 115 B'way, N.Y.
Ensign Mfg. Co., Huntington, West Va.
Erie Car Works (Limited), Erie, Pa.
Harvey Steel Car Co., Chicago., Ill.
Jackson & Sharp Co., Wilmington, Del.
Jackson & Woodin Mfg. Co., Berwick, Pa.
A. S. Males & Co., Cincinnati.
Michigan Car Co., Detroit, Mich.
Middletown Car W'ks, Middletown, Pa.
N. Y. Equipment Co., 15 Wall St., N. Y.
R. M. Pancoast, Camden, N. J.
Pardee Car & Mach. Wks, Watsont'n, Pa.
South Baltimore Car Works, Baltimore.
St. Charles Car Co., St. Charles, Mo.
Wason Mfg. Co., Springfield, Mass.
Youngstown (Ohio) Car Mfg. Co.

Cars, Second Hand
Reginald Canning & Co., 115 B'way, N.Y.
A. S. Males & Co., Cincinnati.
N. Y. Equipment Co., 15 Wall St., N. Y.

Car Couplings
Auto. Interchangeable Car Coupler Co., San Francisco, Cal.
Drexel Car Coupler Co., Rookery, Chic.
Gould Coupler Co., Buffalo, N. Y.
Hinson Car Coupler Co., Chicago, Ill.
McConway & Torley Co., Pittsburgh, Pa.
St. Louis Car Coupler Co., St. Louis, Mo
Smillie Coupler & Mfg. Co., Newark, N.J.
The Standard Car Coup. Co., Troy, N.Y.
Trojan Car Coupler Co., Troy, N. Y.
Thurmond Car Coup. Co., 80 B'way, N.Y.
Van Dorston Coup. Co., Phila., Pa.

Car Doors
Q. & C. Co., Chicago, Ill.

Car Furnishings
Dayton Mfg. Co., Dayton, O.

Car Heaters
Baker Heater Co., 789 Gr'nwich St., N.Y.
Consol. Car Heating Co., Albany, N. Y.
Gold Car Heat. Co., Frankfort St., N. Y.
Martin A. F. Car-Heat. Co., Dunkirk, N.Y
Morton Safety Heating Co.
National Car Heating Co., Chicago.
Railroad Lighting & Mfg. Co., Phila., Pa.
Safety Car Heat. & Light Co., 160 B'way, N. Y.

Car Heating Equipment
Stanley G. Flagg & Co., Philadelphia.

Car Machinery
Greenlee Bros. & Co., Chicago.

Car Platform Gates
J. B. Goodwin, 29 B'way, N. Y.

Car Plushes
Sanford Mills, 129 Wash'ton St., Boston.

Car Replacers
Q. & C. Co., Chicago.

Car Seats
Hartford Woven Wire Mattress Co., Hartford, Conn.
Hale & Kilburn Mfg. Co., Phila.

Car Seals
Buffalo Seal & Press Co., Buffalo, N. Y.

Car Roofs
C. B. Hutchin's Sons, Detroit.
Lee Composite Mfg. Co., New York.

Car Upholstering
Knitted Mattress Co., Canton Jct., Mass.

Car Wheel Presses
Tinius Olsen & Co., Philadelphia, Pa.

Car Wheels
Allen Paper Car-Wheel Co., Chicago, Ill.
American Steel Wheel Co., N. Y. City.
Baltimore Car-Wheel Co., Balto., Md.
Barnum & Richardson Mfg. Co., Chic.
Bowler & Co., Cleveland.
Cayuta Wheel & Foundry Co., Sayre, Pa.
Cushion Car Wheel Co., Indianapolis.
Davenport & Fairbairn, Erie, Pa.
Detroit Car-Wheel Co., Detroit, Mich.
Dickson Car Wheel Co., Houston, Tex.
C. G. Eckstein & Co., 32 Liberty St. N.Y.
Jersey City Wheel Fd'y & Mach. Works,
Lima Machine Works, Lima, O.
Lobdell Car-Wheel Co., Wilmington, Del.
Louis. Car-Wheel Co., Louisville, Ky.
Michigan Car Co., Detroit, Mich.
N. Y. Car Wheel Works, Buffalo.
Thos. Prosser & Son, 15 Gold street. N.Y.
Ramapo Wheel & F'dry Co., Ramapo, N.Y.
Stand. Steel W'ks, 220 So. 4th St., Phila.
Taylor Iron & Steel Co., High Bridge, N.J.
Washburn Car-Wheel Co., Hartf'd, Conn.
Wason Mfg. Co., Springfield, Mass.
A. Whitney & Sons, Philadelphia, Pa.

Car Window Balance
Caldwell Mfg Co., Rochester, N. Y.
O. K. Gardiner, Box 171, Pittsburgh, Pa.

Cattle Guards
Kalamazoo R. R. Veloc. & Car Co., Kalamazoo, Mich.
National Surface Guard Co., Chicago.

Coal Chute
Williams, White & Co., Moline, Ill.

Coal Transferring
C. W. Hunt Co., 45 Broadway, New York.

Consulting Engineers
Thomas Appleton, 505 Rialto Bldg., Chic.
G. Bouscaren, Cincinnati, O.
D. L. Barnes, The Rookery, Chicago.
J. J. R. Croes, 13 William St., N. Y.
S. W. Frescoln, World Bldg., N. Y.
W. C. Foster, 52 Broadway, N. Y.
Geo. L. Fowler, 53 Broadway, N. Y.
Albert Lucius, 71 Broadway, N. Y.
W. B. Parsons, 35 Broadway, N. Y.
Chas. Paine & Sons, 71 Broadway, N. Y.
F. H. Smith, 227 E. German St., Balto., Md.
Von Schon & Garrer, Fredericksb., Va.
J. A. L. Waddell, Kansas City, Mo.
Wilson Bros. & Co., Philadelphia, Pa.

Consulting Electrical Engineers
Sprague, Duncan & Hutchinson, N. Y.

Conveyors
Link Belt Eng. Co., Nicetown, Phila.

Copper
Hendricks Bros., 40 Cliff street, N. Y.

Cordage
Samson Cordage Works, Boston, Mass.

Cranes
Industrial Works, Bay City, Mich.
John N. Poage, Cincinnati, O.
R. D. Wood & Co., Philadelphia, Pa.
Yale & Towne Mfg. Co., Stamford, Conn.

Creosoting
Creosote Lumber & Construction Co. Fernandina, Fla.
Lehigh Valley Creo. W'ks., P. Amboy, NJ.

Crossings
Fontaine Crossing Co., Detroit, Mich.

Crossing Gates
Bogue & Mills Mfg. Co., Chicago.

Culvert Pipe
Blackmer & Post, St. Louis, Mo.

Door Springs
Norton Door Check & Spring Co., Boston.

Draft Rigging
Schoen Mfg. Co., Pittsburgh, Pa.

Drawbar Attachment
Amer. Cont. Draw-Bar Co., Aurora, Ind.
American Steel Wheel Co., N. Y. City.
Butler Drawbar Attach. Co., Cleveland.
Hinson Drawbar Attach. Co., Chicago.

Dredging Machinery
Bucyrus (O.) Steam Shovel & Dredge Co.
San Francisco Bridge Co., California.
Vulcan Iron Works, Chicago.
Vulcan Iron Works, Co., Toledo.

Drop Forgings
Billings & Spencer Co., Hartford, Conn.

Electric Crossing Signal
Electric Supply & Mfg. Co., Cleve'd, O.

Electric Headlights
Nat. Elect. Headlight Co., Indianapolis.

Electric Motors
Thomson-Houston Motor Co., Boston.

Electric Railways
Thomson-Houston Electric Co., Boston.

Elevators
Link Belt Eng. Co., Nicetown, Phila.

Emery Wheels
N. Y. Belt. & Packing Co., 15 Park Row.
Northampton Emery W. Co., Leeds, Mass.
Tanite Co., Stroudsburg, Pa.

Engineering Instruments
Chas. H. Brightly, Philadelphia Pa.
Keller & Brightly Philadelphia, Pa.
C. P. Ketcham & Co., 21 Nassau St., N. Y.
Keuffel & Esser, New York City.
Queen & Co., Philadelphia, Pa.
Young & Sons, Philadelphia, Pa.

Engines
Fishkill Landing Mch. Co., Fishkill, N.Y.
Philadelphia Engineering Wks., Phila.
Westinghouse Machine Co., Pittsburgh.

Excavators
Bucyrus (O.) Steam Shovel & Dredge Co.
Industrial Works, Bay City, Mich.
A. S. Males & Co., Cincinnati, O.
Marion Steam Shovel Co., Marion, O.
Osgood Dredge Company, Albany, N. Y.
J. Souther & Co., Boston, Mass.
Vulcan Iron Works, Chicago.

Explosives
Rendrock Powd. Co., 23 Park Place, N.Y.

Feed-Water Purifier
Field Water Purifier Co., Chicago.

Flexible Shafting
Stow Flexible Shaft Co., Phila., Pa.
Stow Mfg. Co., Binghamton, N. Y.

Fluoride
Amer. Fluoride Co., 126 Liberty St.

Freight Cars, Second Hand
New York Equip. Co., 15 Wall St., N. Y.

Freight Conveyors
Industrial Works, Bay City, Mich.

Forges
The Foos Mfg. Co., Springfield, O.

Frogs and Crossings
Allentown Rolling Mill, Allentown, Pa.
Cleveland (O.) Frog & Crossing Co.
Elliott Frog & Sw. Co., E. St. Louis, Ill.
Johnston R. R. Frog & Switch Co., Phila.
Pennsylvania Steel Co., Steelton, Pa.
Ramapo Iron Works, Hillburn, N. Y.
Union Switch & Signal Co., Pittsburgh.
Weir Frog Co., Cincinnati, O.

Furnaces
Abendroth & Root M.Co., 28 Cliff St., N.Y.

Gauges (Pressure)
Ashcroft Mfg. Co., 111 Liberty St., N. Y.

Grader, Ditcher & R. R. Builder
F. C. Austin Mfg. Co., Chicago, Ill.

Guarantee Co.
Guarantee Co. of N. A., Montreal.

Harbor Works
S. W. Frescoln, World Bldg., N. Y.

Hand Cars
The Buda Fdy & Mfg. Co., Harvey, Ill.
Fairbanks, Morse & Co., Chicago.
Kalamazoo (Mich.) R. R. Veloc. Co.
Sheffield Velocipede Car Co., Three Rivers, Mich.

Highway Crossing Signals
Electric Supply & Mfg. Co., Cleve'd, O.

Hoisting Engines
Copeland & Bacon, New York City.
Industrial Works, Bay City, Mich.
Lidgerwood Mfg. Co., 96 Liberty St., N.Y.
J. S. Mundy, Newark, N. J.
Vulcan Iron Works Chicago.

Hollow Stay Bolt Iron
Falls Hollow Stay Bolt Co., Cuyahoga Falls, O.

Hydraulic Jacks
Richard Dudgeon, 24 Columbia St., N. Y.
Joseph F. McCoy Co., 26 Warren St., N.Y.
Watson & Stillman, 210 E. 43d St., N. Y.

Hydraulic Machinery
Tinius Olsen & Co., Philadelphia, Pa.
Union Iron Works, San Francisco.
Watson & Stillman, N. Y. City.
R. D. Wood & Co., Philadelphia, Pa.

Injectors
Nathan Mfg. Co., 91 Liberty street, N.
Wm. Sellers & Co., Philadelphia.

Inspectors of Bridges and Ry. Equipment
R. W. Hilderth & Co., 2 Wall St., N. Y.

Insurance
Hart. Steam Boiler Insp. & Ins. Co., Hartford.
Royal Ins. Co., 50 Wall street, N. Y.

Interlocking Switches & Signals
Allentown Rolling Mills, Allentown, Pa.
Ball Signal Co., 50 B'way, N. Y.
Kelsey R. R. Signal Co., Florence, Mass.
Nat. Switch & Signal Co., So. Bethlehem, Pa
Union Switch & Signal Co., Pittsburgh.
Wharton R. R. Switch Co., Phila.

Iron—Taylor Yorkshire
E. M. Jones & Co., Boston, Mass.

Iron Work for Contractors
Edge Moor Bridge Wks, Wilmington Del.
King Bridge Co., Cleveland, O.

Iron & Steel Ship Builders
Union Iron Works, San Francisco.

Jacks
Fairbanks, Morse & Co., Chicago.
McSherry Mfg. Co., Dayton, O.
Richard Dudgeon, 24 Columbia St., N. Y
Watson & Stillman, 210 E. 43d St., N. Y.

Journal Bearings
Ajax Metal Co., Philadelphia, Pa.
Deoxidized Metal Co., Bridgeport, Conn.
D. A. Hopkins Mfg. Co., 143 Liberty St., N. Y.
Phosphor-Bronze Smelting Co., Philada.
Paul S. Reeves, Philadelphia, Pa.

Journal Bearings—Tubular
Meneely Bearing Co., W. Troy, N. Y.

Journal-Box Lids
Ramapo (N. Y.) Wheel & F'dry Co.

Lighting
Adams & Westlake Co., Chicago.
Railroad Lighting & Mfg. Co., Phila., Pa.
Safety Car Heat. & Light. Co., 160 B'way.

Link Belting
Link Belt Eng. Co., Nicetown, Phila.

Lock Washers
Nat. Lock Washer Co., Newark N. J.

Locomotives
Baldwin Locomotive Works, Philada.
Brooks Locomotive W'ks, Dunkirk, N.Y.
Cooke Loco. & Mach. Co., Paterson, N.J.
Dickson Mfg. Co., Scranton, Pa.
G. L. Fowler, 53 Broadway, N. Y.
Lima Machine Works, Lima, O.
A. S. Males & Co., Cincinnati, O.
N. Y. Equipment Co., 15 Wall St., N. Y.

RAILROAD GAZETTE DIRECTORY CLASSIFIED ADVERTISEMENTS.

Locomotives (Continued)
Pittsburgh Loco.& Car Wks,Pittsburgh.
H. K. Porter & Co., Pittsburgh, Pa.
Richmond (Va.) Loco. & Mach. Works.
Rogers Loc. & Mch.Wks., Paterson, N. J.
Schenectady (N. Y.) Loco. Works.
Taite & Carlton, London, Eng.
Wharton R. R. Switch Co., Phila.

Locomotive Boiler Tubes.
Allison Mfg. Co., Philadelphia, Pa.

Locomotive Finishing Varnish
Flood & Conklin, Newark, N. J.

Locomotive Headlights
Adams & Westlake Co., Chicago.
Nat. Elect. Headlight Co., Indianapolis.

Locomotive, Second-Hand
Reginald Canning & Co., 115 B'way,N.Y.
A. S. Males & Co., Cincinnati, O.
N. Y. Equipment Co., 15 Wall St., N. Y.

Locomotive Staybolt Iron
Falls Hollow Staybolt Co., Cuyahoga Falls, O.

Lubricators
American Supply Co., Kansas City, Mo.
Nathan Mfg. Co., 92 Liberty street, N.Y.

Machinists' Tools
Acme Machy. Co., Cleveland, O.
Bement, Miles & Co., Philadelphia, Pa.
Billings & Spencer Co., Hartford, Conn.
E. W. Bliss Co., Brooklyn, N. Y.
Brown & Sharpe Mfg. Co., Providence, R. I.
Ferracute Machine Co., Bridgeton, N. J.
Gould & Eberhardt, Newark, N. J.
Edw. Harrington, Son & Co., Phila.
Hayes Tool Co., Portland, Me.
Long & Allstatter Co., Hamilton, O.
Manning, Max. & Moore, 111 Liberty St.
Morse Tw.Dr.& Mach.Co.,N.Bed'd, Mass.
Newark Mach. Tool Wks., Newark,N. J.
Niles Tools Works, Hamilton, O.
Pedrick & Ayer, Philadelphia, Pa.
Geo. Place, 120 Broadway, N. Y.
D. Saunders' Sons, Yonkers, N. Y.
Wm. Sellers & Co., Philadelphia.
Stiles & Parker Press Co., Middletown, Conn.
Stow Flexible Shaft Co., Phila., Pa.
Stow Mfg. Co., Binghamton, N. Y.
Universal Radial Drill Co., Cincinnati.
Watson & Stillman, 240 E. 43d St., N. Y.
Wharton R. R. Switch Co., Phila.

Malleable Iron Castings.
National Malleable Castings Co., Cleveland.

Mandrel Rolled Staybolt Iron
Falls Hollow Staybolt Co., Cuyahoga Falls, O.

Mining Machinery
Lidgerwood Mfg.Co., 96 Liberty St..N.Y.
Union Iron Works, San Francisco.

Mop Wringer
Boston Wringer Co., Boston.

Nut Locks
Amer. Washer & Mfg. Co., Newark, N. J.
Metcalf, Paul & Co., Pittsburgh, Pa.
National Lock Washer Co., Newark.
Ruffner & Dunn, Philadelphia, Pa.
Standard Nut Lock Co., N. Y.

Oil Cans
Adams & Westlake Co., Chicago.
Bryant & Barbey, 79 Milk St., Boston.
H. A. Williams Mfg. Co., Boston.

Oil
Signal Oil Works, Ltd., Franklin, Pa.

Ore Handling Machinery.
King Bridge Co., Cleveland, O.

Packing, Asbestos
H. W. Johns Mfg. Co., N. Y. City.

Packing-Rubber
N. Y. Belting & Pack. Co., N. Y. City.
Peerless Rubber Co., 15 Warren St.

Paint
Andress Paint & Color Co., 15 Cortlandt street, N. Y.
F. W. Devoe & Co., Fulton St., N. Y.
Jos. Dixon Crucible Co., Jersey City, N.J.
Standard Paint Co., 2 Liberty St., N. Y.

Patents
Howson & Howson, 119 So. 4th St., Phila.
Geo. P. Whittlesey, Washington, D. C.

Phosphor-Bronze
Paul S. Reeves, Philadelphia.
Phosphor-Bronze Smelting Co., Phila.

Pile Drivers
Bucyrus (O.) Steam Shovel & Dredge Co.
Industrial Works, Bay City, Mich.
Lidgerwood Mfg. Co., 96 Liberty St.,N. Y.
Vulcan Iron Works, Chicago, Ill.

Pipe Cutting & Threading Mach.
D. Saunders' Sons, Yonkers, N. Y.

Pneumatic Foundations
S. W. Prescott, World Bldg., N. Y.

Portable Drills
Frank Reed, Worcester, Mass.
Stow Flexible Shaft Co., Phila., Pa.
Stow Mfg. Co., Binghamton, N. Y.

Pressed Steel
Schoen Mfg. Co., Pittsburgh, Pa.

Pumps
Fairbanks, Morse & Co., Chicago.
Laidlaw & Dunn Co., Cincinnati, O.
R. D. Wood & Co., Philadelphia, Pa.
H. R. Worthington, 86 Liberty St., N. Y.

Radial Taps
J. T. Connelly, Milton, Pa.

Rails
American Supply Co., Kansas City, Mo.
Bethlehem Iron Co., 90 Broadway, N. Y.
Cambria Iron Co., Johnstown, Pa.
O. W. Child & Co., 115 Broadway, N. Y.
Geo. A. Evans, 40 and 42 Wall St., N. Y.
Humphreys & Sayce, 10 Wall St., N. Y.
Illinois Steel Co., Chicago, Ill.
A. S. Males & Co., Cincinnati.
N. Y. Equipment Co., 15 Wall St., N. Y.
Pennsylvania Steel Co., 2 Wall St., N. Y.
Robinson & Orr, Pittsburgh, Pa.
A. S. Whiton, 115 Broadway, N. Y.

Rail Fastenings
American Supply Co., Kansas City, Mo.
Cambria Iron Co., Johnstown, Pa.
Fisher Rail Joint Works, Trenton, N. J.
A. S. Males & Co., Cincinnati.
Metcalf, Paul & Co., Pittsburgh, Pa.
National Lock Washer Co., Newark, N.J.
N. Y. Equipment Co., 15 Wall St., N. Y.
Morris Sellers & Co., Chicago.
Ruffner & Dunn, Philadelphia, Pa.

Rail Saws
Bryant & Barbey, 79 Milk St., Boston.
Industrial Works Bay City, Mich

Railroad and Transp. Lines
Big Four.
Boston & Albany.
Chicago & Alton.
Chicago, Burlington & Quincy.
Chicago, Milwaukee & St. Paul.
Chicago & Northwestern.
Chicago, Rock Isl. & Pacific.
C., H. & D.
Hoosac Tunnel Route.
Illinois Central.
Lehigh Valley R. R.
Michigan Central.
Missouri Pacific.
New York Central & Hudson River.
New York, Lake Erie & Western.
New York & New England R. R.
Pennsylvania.
Stonington Line.

Railroad Printing
W. H. Campbell, 19 Union Sq., N. Y. Cy
C. F. Ketcham & Co., 27 Nassau St., N. Y.

Railroad Supplies
Bryant & Barbey, 79 Milk St., Boston.
Reginald Canning & Co.,115 B'way,N.Y.
O. W. Child & Co., 115 Broadway, N. Y.
Fairbanks, Morse & Co., Chicago.
E. S. Gresley & Co., 7 Dey St., N. Y.
Intern. Ry. Equipm. & Supply Co., N. Y.
The Johnson R. R. Signal Co., Rahway.
A. S. Males & Co., Cincinnati, O.
N. Y. Equipment Co., 15 Wall St., N. Y.
N. Y. Railway Supply Co., 40 Wall St.
G. D. Peters & Co., London, England.
A. T. Shoemaker, Chicago and N. Y.

Railway Varnishes & Surfacers
Flood & Conklin, Newark, N. J.

Ratchet Drills
Billings & Spencer Co., Hartford, Conn.
Schuttler Mfg. Co., Chicago.

Reducing Valves
Curtis Regul. Co., 89 Beverly St., Boston.
Mason Regulator Co., Boston, Mass.

Refined Iron
Falls Hollow Staybolt Co.

Refrigerator Cars
R. M. Pancoast, Camden, N. J.
So. & Pac. Refrigerator CarCo.,Chicago.

Refrigerating Machinery
De La Vergne Refrig. Machine Co., N.Y.

Rivets, Slotted
J. A. Thomson Mfg. Co., Waltham, Mass.

Rock Ballast and Rock Breakers
Gates Iron Works, Chicago, Ill.

Rock Drills
Ingersoll-Sergeant Rock Drill Co., N. Y.
Rand Drill Co., 23 Park Place, New York.

Roofs
Berlin Iron Bridge Co., E. Berlin, Conn.
King Bridge Co., Cleveland, O.

Rolling Journal Bearings
Menesley Bearing Co., W. Troy, N. Y.

Rolling Stock to Lease
Oliver Adams, 32 Liberty St., N. Y.

Rubber Belting
N. Y. Belting & Pack. Co., 15 Park Row.
Peerless Rubber Co., 15 Warren St.

Safety Valves
Ashton Valve Co., Boston, Mass.

Saw Mills
Richmond (Va.) Loco. & Mach. Wks.

Second-Hand Rolling Stock
A. S. Males & Co., Cincinnati.

Sewer Pipe
Blackmer & Post, St. Louis, Mo.
R. D. Wood & Co., Philadelphia, Pa.

Sewerage
J. J. R. Croes, 13 William St., N. Y.

Shafting
Wm. Sellers & Co., Phila.

Skylights
Valle & Young, 309 No. St. Baltimore, Md
E. Van Noorden & Co., Boston.

Signals.
Hall Signal Co., 50 Broadway, N. Y.
Johnson R. R. Signal Co., Rahway, N. J.
Kelsey R. R. Signal Co., Florence, Mass.
Kinsman Bl'k System Co., 143 Liberty st.
Nat. Switch & Signal Co., So.Bethlehem, Pa.
Union Switch & Signal Co., Pittsburgh.

Snow Shovels and Plows
Jull Mfg. Co., Brooklyn.
Leslie Bros. Mfg. Co., Paterson, N. J.

Solid Staybolt Iron
Falls Hollow Staybolt Co., Cuyahoga Falls, O.

Spikes
Dilworth, Porter & Co., Pittsburgh, Pa.
Q. & C. Co., Chicago.
Morris Sellers & Co., Chicago.

Springs
Atkinson Steel & Spring Works, Chicago, Ill.
Farist Steel Co., Bridgeport, Conn.
A. French Spring Co., Pittsburgh, Pa.
Pickering Spring Co., Philadelphia.
Chas. Scott Spring Co., Philadelphia, Pa.

Stand Pipes
John N. Poage, Cincinnati, O.
King Bridge Co., Cleveland, O.
Sheffield Veloc. Car Co., Three Rivers, Mich.

Staybolt Iron
Falls Hollow Staybolt Co., Cuyahoga Falls, O.
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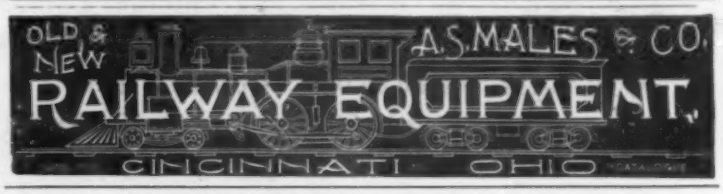

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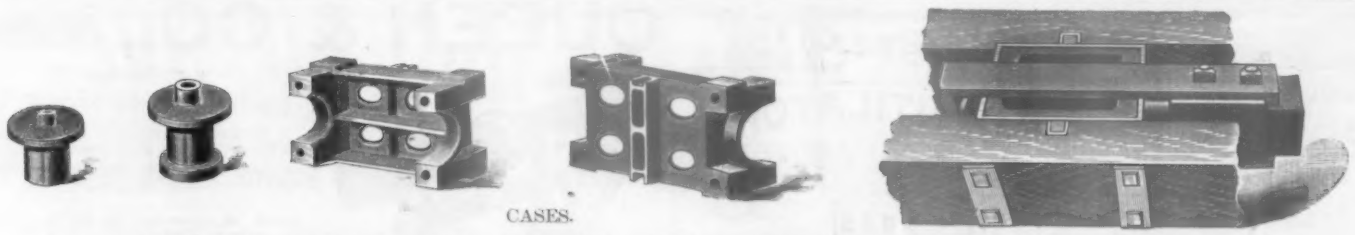

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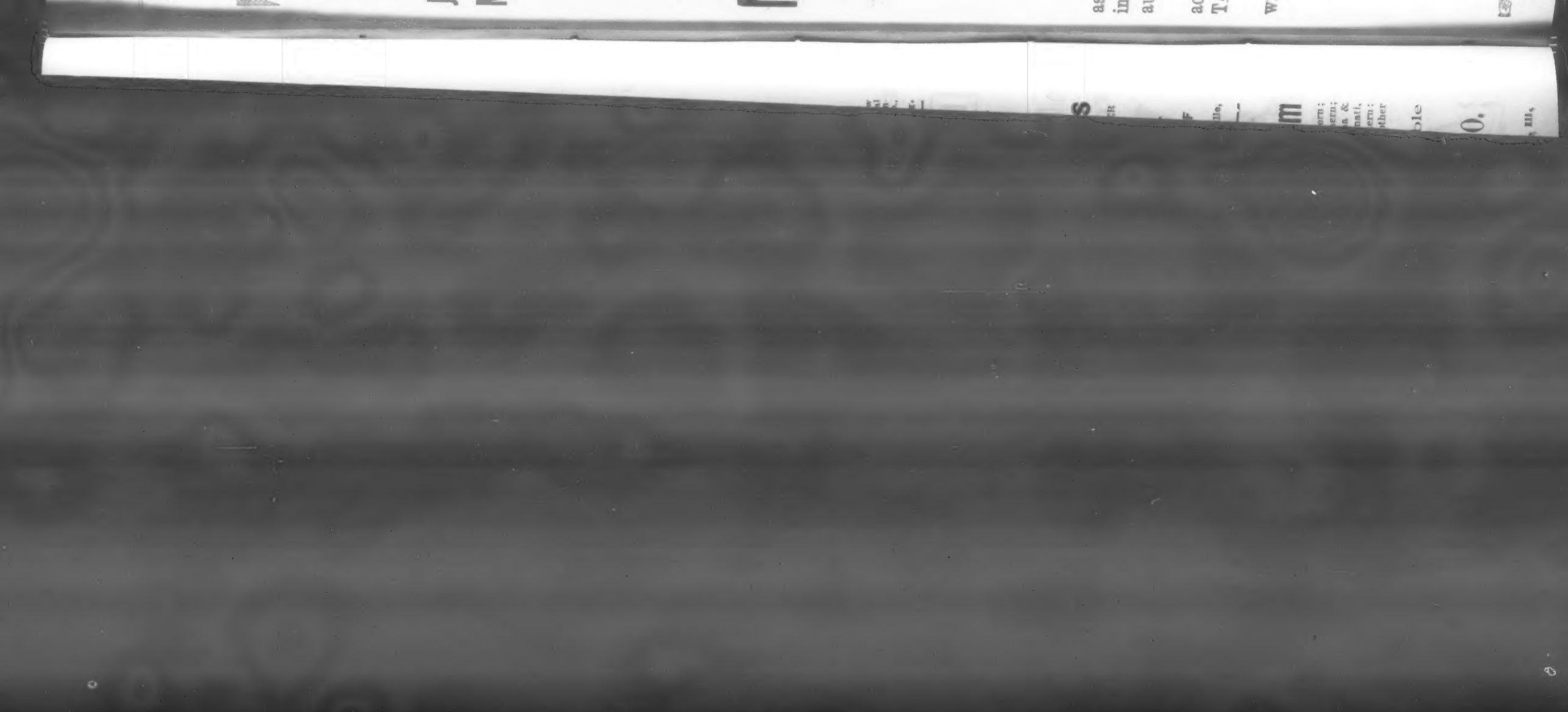

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RAILROAD GAZETTE

FRIDAY, MARCH 18.

CONTENTS.

Contributions.

The Extension Front and Compound Locomotives.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I am glad to notice in your issue of Feb. 26 Mr. J. Snowden Bell's comments on the use of the extended front end with the Vauclain compound engine. There certainly seems no reason other than tradition for this complication. The locomotive of the future will not need the long extension front and the baffle plate is another feature which is not needed with a good construction. This will seem like heresy to a good many of our mechanical superintendents, but there is no stronger opposition to the change than there was years ago against the adoption of the straight stack. The straight stack, especially when made with a slight taper to conform to the cone of the exhaust steam blast, is the correct theoretical construction, and has accordingly proved itself to give the best results in practice. We will probably retain the netting in the front end, as it presents but little hindrance to the draft, and is useful in case of tearing the fire by slipping when there is more tendency to throw sparks than with ordinary working.

C. M. H.

Single Driver Engines.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Referring to the article of W. H. B. in the GAZETTE of July 12, what would be considered a modern single driver engine? W. H. B. wants to know if any such have been tried in America. Not long ago a single driver engine was built in Boston weighing about 80,000 lbs., 18 in. × 24 in. cylinders, link motion, tyre milled off in facets to give more surface contact with the rail, expecting such increased contact to give greater adhesion. This engine did not set the river on fire, nor change the views of New England railroad men as to single driver engines or flat spots on tyre.

It would seem from W. H. B's admission that the facts are that English and American railroad men have each adopted the kind of engine suitable for their work. He says "I do not believe that the fault lies with the American engine. If it exists as it seems to, the fault is in the track, and in the car trucks, and from this I believe the writers who condemn single engines are either car builders or track men." The problem before the American Master Mechanics is to haul American trains on American tracks, and to him the single driver is not the best because it will not do the work. He admits more power with more drivers, and it is a little hard to see the superiority claimed for single drivers. Perhaps in view of the handling of a train by the New York Central Railroad, engine and tender, 100 tons, cars empty 130 tons, 436 miles in 430 minutes, including time lost changing engines twice and once cooling a hot journal, he may be willing to accept a modern American engine as doing creditable work, especially when he makes further allowance for time lost by running at low speed for some distance from the starting point and slowing up in large towns on the route.

SUPERINTENDENT.

The Regulation of Braking Power According to Load.

CHICAGO, March 2, 1892.

TO THE EDITOR OF THE RAILROAD GAZETTE:

"The freight car in use 20 years ago was in appearance not unlike those we now use; but the difference in construction is considerable. The most important change has been, of course, in the increase of capacity. The old cars were adapted to carry 24,000 lbs., and weighed 20,000 lbs., or .8 lb. of dead weight per lb. of rated useful load. The present car weighs about 30,000 lbs., and has a capacity of 60,000 lbs., or .5 lb. of dead weight per lb. of rated useful load. From this it is seen that there has been 37 per cent. decrease in dead weight of box freight cars per ton of full-rated load."

The above quotation is taken from a paper on "Recent Progress in Car Construction," read before the Western Railway Club at its January meeting. It brings forcibly to the mind of all air brake men a problem, the solution of which will soon become an imperative necessity. Plainly stated the question is, how are we to secure an efficient emergency brake on loaded trains, when the load is so much heavier than the light weight of the car that the 70 per cent. leverage allowed on light cars amounts to little if any more than 20 per cent. of the total weight of the same cars when loaded? As an illustration, let us take the case of the ore cars now in service on some of the iron ore roads. The light weight is 22,000 lbs. Though marked for only a 40,000-lb. load, it is notorious that they are almost always overloaded, sometimes carrying over 50,000 lbs. The difference in weight of different grades of ore is largely responsible for this, some kinds being very much heavier than others.

Suppose, then, the braking power to be 70 per cent. (15,400 lbs.) of the light weight (22,000 lbs.). The total weight of the car, loaded, is 72,000 lbs. and the braking power (15,400 lbs.) is but a little over 21 per cent. of this, and it is also to be remembered that this is figured for full emergency application, and that in all service stops the braking power is from 15 to 20 per cent. less, reducing the pressure of the shoe against the wheel to about 17 per cent. of the weight carried by the wheel. There are other classes of cars of heavy carrying capacity on which the percentage of the braking power is approximately the same.

All men who have had any experience in handling loaded, air brake freight trains on grades know how difficult it is to keep such trains under full control, for a very little carelessness, such as wasting air by unnecessarily heavy or frequent reductions of pressure will soon result in a runaway. The frequency of accidents to freight trains, even such as are entirely equipped with air, is a source of surprise to many railroad superintendents. Collisions occur in places and under conditions where it seems as if there should have been ample time and space to stop, and yet cases are exceedingly rare where there are any grounds for supposing the brakes did not set. Why was it, then, that the train did not stop? The answer generally given is that the engineer must have carelessly frittered away his pressure immediately before the emergency, or else did not have his train fully charged. This statement frequently has a foundation in truth, but the other conditions should not be ignored in placing the responsibility.

When the adjustment and care that is given to freight brakes (or more correctly speaking ought to be given and is not) is taken into consideration it is safe to assert that it takes an average air brake train of loaded freight cars fully four times the distance to make a stop that would be required by an ordinary passenger train. Is not this difference too great for safety where both classes of trains are run on the same track at nearly the same rate of speed?

So far we have only considered the facts of the case as at present existing. Let us look into the future, and viewing it in the light of past developments, see whether the prospects are for improvement or the opposite. Decidedly the latter, for with the introduction of improved methods of car construction and new materials of greater strength proportional to the weight, the car itself is constantly growing lighter in proportion to the load carried. If the new metal, with a specific gravity only one third that of iron, were to be utilized in the construction of railroad equipment the light weight of the car would be so small in proportion to the load that the brake as at present designed, would be practically valueless.

PAUL SYNNESTVEDT.

A Heater Explosion.

NEW YORK, March 11, 1892.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Your readers are doubtless already aware of the fact that a serious explosion happened in a passenger train on the Atchison, Topeka & Santa Fé, near Meriden, Kan., on the night of March 5. While the train from St. Joseph to Topeka was running at moderate speed near that place, the heater in the smoking car suddenly exploded, wrecking the end of the car and injuring five of its occupants, two of them very seriously. The accounts do not give a clear description of the causes of the explosion, but in view of what has been learned about them from other sources, I beg to present the following points about safety vents and valves on Baker heaters.

An indispensable feature in the Baker car heater is the provision for instant relief of the dangerous pressure within it, which is sure to occur when the two simple rules relating to the water are disobeyed. These rules are, 1, the water must be saturated with salt to prevent freezing; 2, the water in the circulating pipes must not be allowed to get so low that the ends of the two pipes—the rising and the descending—are not submerged in the water of the drum. If the water gets thus low, the circulation ceases, the heating pipes get cold and the pressure increases rapidly, because the small quantity of water in the generator coil flashes into steam, and an irresistible pressure accumulates. Although the drum will stand 2,500 lbs. to the square inch, it will burst and fly into pieces in every direction, resulting in damage to the car, and jeopardizing the lives of the passengers. When I first invented the heater, the matter of "safety valves" gave me more thought and trouble than anything else connected with it. I tested every device, including everything that had spiral springs; but the rubber ball was the most practical device at that time. This is the style of "safety valve," so called, still used on many Baker heaters, and the kind that was on the heater that blew up the car at Meriden.

About five years ago I tested—and have since put into very general use—a cast iron safety vent, which is of a spheroidal form, cast in a single piece. This is of the same metal as is the drum, into which it is screwed, but it is only 0.1 in. thick, instead of ⅛ in., the thickness of the drum. In other words, it is the one weak spot of the heater, and will, in an emergency, give way, and cause no other damage than to require the fire cooled down and another vent screwed into its place, which is done by hand. Being in a single piece, it cannot be tampered with, as can the old style rubber ball. When it is discovered leaking the brakeman screws it down (with an ordinary screw driver) till it is tight, with no reference as to what pressure it will again "blow off" at. The rubber ball, being devulcanized and softened by the heat, can be pressed down into an oblong form, and there is no knowing at what pressure it will again yield, but most likely it will be as solid as an iron plug screwed into the drum. Thousands of these jointless safety vents have been in use the last five years, yet the old style has not been abandoned, because it is a cheaper article to buy, and when it does blow out it is not a telltale of gross neglect as is the safety vent. If railroad mechanics would take pains to look into this matter as it actually exists, there would be no more casualties like the one above referred to.

W. C. BAKER.

[The cast iron safety vent was illustrated and described in the *Railroad Gazette* of April 10, 1891, page 246.—EDITOR.]

The Intercontinental Railroad.

NEW YORK, March 12, 1892.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Your comments in the *Gazette* of March 4, upon the *Forum* article on "The Intercontinental Railroad Problem," require the addition of data which the limitations of a magazine discussion prevented me from giving there. In my estimate of 2,900 miles in such a route remaining unoccupied by existing roads and concessions I have made an extremely liberal allowance for détours in the links which would have to be constructed to give us a North and South American trunk line. There exists continuous rail connection from New York, 2,663 miles, to Jojutla, 183 miles south of the City of Mexico, and this line will be opened as far as Oaxaca, over 200 miles further, by June 1, 1892. From this point the territory is covered by an almost continuous string of concessions to San José, the capital of Costa Rica, distributed as follows: About 380 miles to the Guatemalan frontier, 120 miles across Guatemala, 170 in San Salvador and 210 in Nicaragua and Costa Rica, a total of 880 miles, of which 75 miles in Costa Rica is being constructed by Mr. Keith, and will certainly be in operation within five years.

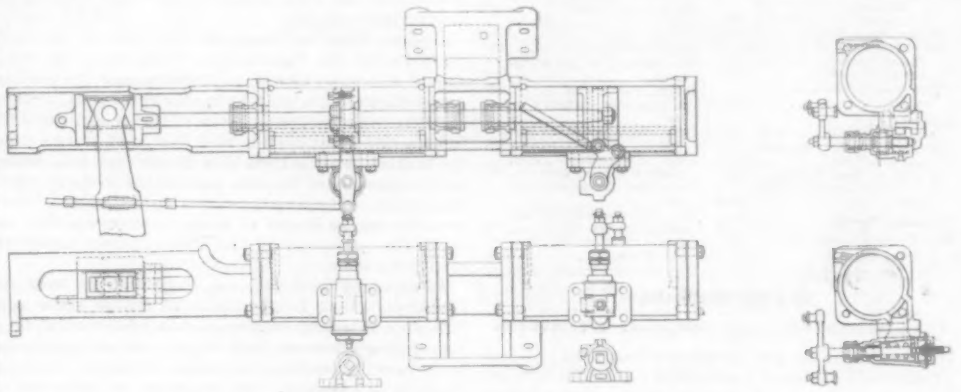
In this distance occur three short lines already in operation, viz., two in Nicaragua 58 and 32 miles long respectively, and one in Costa Rica of 35 miles. The gaps which remain aggregate about 200 miles. From San José, Costa Rica, to the Southern Railway in Peru, is a long interval, which I have estimated at 2,700 miles, a figure undoubtedly in excess of that which would be arrived at by a careful survey. I may add that I have allowed for a détour from the valley of the Upper Amazon, or Marañon, to the west coast at Payta, which would increase the length of such a line, but save the heavy work necessary to reach Cerro de Pasco. The entire distance from Puno, the terminus of the Southern Railway, across Bolivia to the present terminus of the National Central Northern Railway of Argentine, about 800 miles, is completely covered by concessions, and construction is now proceeding on at least two of these new roads at a very creditable rate of speed. These 800 miles of road, at their present rapid progress, will be in operation within five years. In fact as much as 200 miles of it will be opened to traffic this spring, and if recent reports are true, the new section of the Antofagasta Railway has reduced the distance another 100 miles. This would leave 1,380 miles of road projected, of which 500 miles in South America and 75 miles in Central America will be constructed within five years.

An estimate of cost I refrained from guessing at for obvious reasons, but we should remember that enough is known of the region through which such a road would pass to show that no difficulties will be encountered surpassing those already surmounted by existing lines in South America, and that the conditions of the country do not necessarily interfere with economical construction is abundantly proven by the feat accomplished by Mr. John C. Thorndyke, of New York, who completed the Mollendo & Arequipa Railway, in Peru, in two years, at a cost of $2,000,000, the length of the line being 107 miles, rising within that distance to an altitude of 7,850 ft. above the sea.

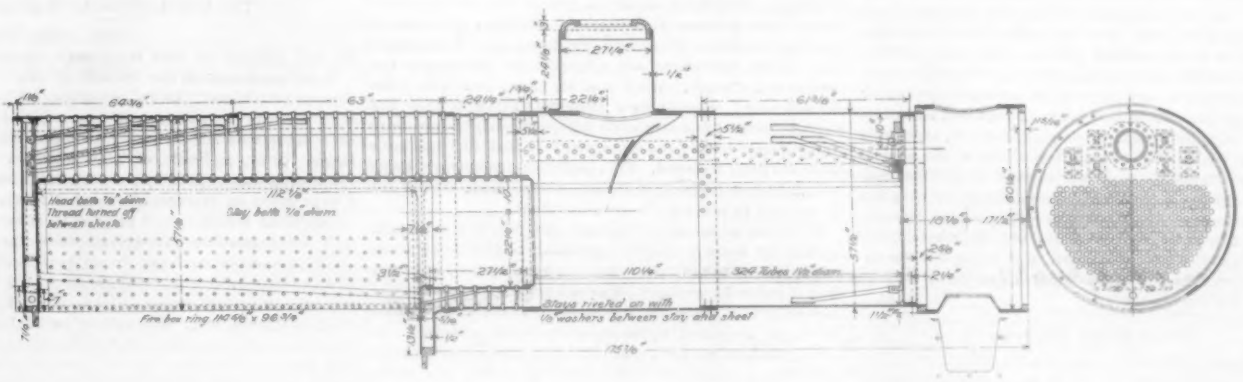
It would exceed the limits of this communication to discuss the possibility of creating an extensive commerce in the regions remaining to be traversed. The whole

route, however, is known through the works of explorers, some of whom have been able scientists, and there is no doubt concerning the general physical conditions, the products of the country and the character of the inhabitants. The entire line might be laid out within the limits of distance mentioned without passing through more than 100 miles of country capable of supporting only a very scanty population, and this region lies between Popayán, Colombia, and Ibarra, Ecuador, directly in the line of that through traffic which is certain to flow eventually from the Ecuadorian plateau through Colombia to the Carribbean Sea. Of course, to build up the valley of the Marañon to Cerro de Pasco, Peru, would result in causing the road to pay toll to a barren pass, but with so much good country needing development to the westward, it seems improbable that such a course would in any case be decided upon. There is probably no line of equal magnitude possible on the earth's surface which would pass through so little unproductive territory.

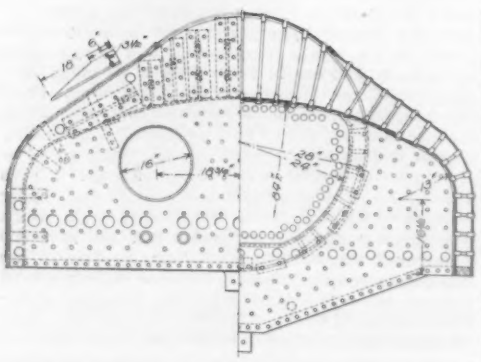
The question of the profitableness of the undertaking is altogether another matter, but this is hardly worth discussing, for the "Intercontinental Railroad" will never be built as one grand enterprise. There is, however, reason enough for believing that it will come as a gradual growth, and the chief purpose of the *Forum* article was to point out the peculiarities of the development of the present railroad systems in South America, and to show that conditions of trade similar to those which had led to the construction of useful lines in other parts of the continent were now inviting the attention of capitalists to Colombia and Ecuador. These states, it was maintained, will, by reason of their situation, the trend of their remarkable valleys and plateaus, and their natural resources, prove the key to the control of an immense proportion of South American commerce, which key will be held by whatever nation furnishes the capital for building the roads which the growth of the next few years will necessitate. Hence, it was urged that our capitalists should investigate the merits of such proposed lines, and build them whenever there should



Steam Reversing Gear. Philadelphia & Reading Express Locomotive.



BOILER, PHILADELPHIA & READING EXPRESS LOCOMOTIVE—CLASS "D 44-11."



appear to be sufficient immediately prospective traffic for their support. My effort was not to present even so much as an attempt at a solution of the intercontinental railroad question, but to indicate the factors in the problem, and to give an analysis of the situation. Among other things it was said: "speculative and whimsical considerations have in no instance been instrumental in creating railroad systems in South America, but these have been called into existence in response to the needs of a commerce previously developed into considerable magnitude. . . . Pioneer roads, built for the sake of creating new centres of industry, have formed no part of the South American railroad programme, and it is doubtful whether such a plan would meet with any success for many years to come. . . . The actual needs of an immediate commerce must determine the railroad development of the Latin continent. A study of these exigencies then ought to demonstrate what hope there is for the realization of an intercontinental railroad." Statistics of interstate trade in South America were given, which show a powerful tendency to an exchange of products, very remarkable under the existing difficulties of intercommunication. Also it was shown that for the central portion of the United States an alljoy. It is this part of the future South American railroad system, from some Caribbean port in Colombia southward, which is of vital importance to us, and we should hold such control over it as to direct its policy in the interest of our trade extension. The building of roads from Mexico southward to connect with this system is of far less immediate consequence to us. Such roads will be built without our aid in the near future, and by reason of their intermediary position they will be sufficiently ready to make overtures for through business to any extent that we might desire for the realization of those advantages which might accrue from intercontinental connection. Personally I believe that these will be very great, but in controlling a system of roads from the north coast down to Peru we will possess the key to the situation.

COURTENAY DE KALB, M. E.

Philadelphia & Reading Express Locomotive, Class "D 44-11."

[WITH AN INSET.]

We have on several occasions referred to the admirable locomotive equipment of the Philadelphia & Reading, and in this issue we give very complete illustrations of one type of express locomotive of that railroad, with the general dimensions. Further details with indicator cards and some details of performance will follow. This engine can be taken as one of the most powerful locomotives at high speed now running in the United States. It has a large grate surface, which is incident to the Wooten boiler, so extensively used on the Reading road, and a valve motion and design which gives, as shown by the indicator cards, probably a better distribution of steam at a speed of 70 miles an hour than any other design now used here. This is a strong statement, but we believe that any one who is thoroughly well informed will reach the same conclusion after an examination of indicator cards, the details of which will be given.

To our foreign readers this engine will be especially interesting, as it represents a distinct type. A description of the arrangement of the parts is unnecessary owing to the completeness of the illustrations. It may be well to state, however, that the firebox is wholly above the driving wheels, and the crown sheet is of an unusually large area, giving an economy in water evaporation which is probably unsurpassed. There have been discussions as to the maintenance of this type of boiler, but after careful examination it appears that whatever trouble there has been in service has resulted, not from the design of the engine, but from lack of proper care. We cannot find that the stay bolts in these boilers give any more trouble than those in other large locomotive boilers. Of course, in any boiler where there are flat surfaces having screw stays which have considerable expansion in any one direction there will be broken stay bolts as a result of such expansion, and this is more particularly true of those boilers where the shapes are cramped in any way so as to localize the expansion.

One peculiar feature of these engines, and which gives the engineer a most perfect control over the steam expansion, is the reversing gear, which is operated by steam. A simple movement of the handle, shown in the engraving, throws the reverse lever in either direction, or checks it at any point without the exertion of any considerable power by the runner. A reversing gear of this type is not generally used in this country, but it is certainly a convenient apparatus on a high-speed locomotive, and especially where the attention of the engineman is liable to be diverted in looking for signals. With large valves and this reversing gear the cut-off may be changed without reducing the pressure on the valves by closing or partially closing the throttle.

Owing to the high rate of steam production with this style of boiler it is necessary to use three safety valves of large size, all of which are muffled to reduce the noise of discharge. This is a visible proof of the great power of this type of boiler, and one of the difficulties incident to its use and which tends to reduce its economy is the difficulty of regulating the steam pressure in varied working. It is quite a trick with reasonably good coal to prevent these boilers from blowing off when stopping at stations or when there is a decreased demand for steam. In fact the poorest quality of coal can be burned with this type of boiler, and if the exhaust is properly regulated by the variable aperture provided, a pea coal can be used, even on passenger trains, but generally speaking, the blast is too fierce when governed by the ordinary fireman and engineer to permit this, and for that reason in such work a larger sized coal is generally used. In freight service, where there is more opportunity to give attention to fuel consumption a very low grade of anthracite culm can be used.

The evaporating surface in a boiler of this type is great, and by evaporating surface we mean the area of the surface of the water at the water line. This is a feature which regulates the amount of moisture entrained with the steam, and the larger the surface the less will be the moisture carried over from the cylinders, up to a limit where there is no water taken up by the steam in leaving the surface of the water.

One of the most interesting features of this engine is its valve motion, which was first brought out, with some privacy, in 1886, and even to-day it is not gen

erally known that the Reading road has been running engines with valves having 7 in. travel and ⅛ to ¼ inside clearance or negative lap on each side. We have before this called attention to the decided advantage of this arrangement, and the indicator cards here shown prove the value of a long travel and inside clearance. This is more particularly brought out in card No. 21 [to follow], which, at a speed of about 71 miles per hour, corresponding to 348 revolutions, is a better card than that obtained from the average express locomotive at 40 miles per hour. With a boiler pressure of 145 lbs. there is obtained a mean effective pressure of about 44.7 lbs. This is an unusual performance.

This type of engine runs regularly about eight hours under fire, with one cleaning of the fire when running down a grade about three miles long. The distance covered in eight hours is about 205 miles. When used for bituminous coal the grate is covered with brick about 31 in. from the front end. The triple lubricators shown on the drawing were designed especially for the Reading and are now used on a few other roads. The location of the injector checks is such as not to permit the water to be blown off the crown sheet in case a check pipe is broken.

The credit for this excellent design of locomotive, its valve gear and its performance, is due to Mr. L. B. Paxson, Superintendent of Motive Power of this road. Mr. Paxson was the first in this country to use to any extent a 7 in. valve travel with 1¼ in. outside lap and with inside clearance in the valve. He has designed many engines for the different conditions of service on the Reading road having these general features, but this engine we have selected as being one of greatest interest, as with it a speed of 85 miles an hour has been obtained on the fast runs between Philadelphia and New York.

The following are the general dimensions:

Diameter of cylinders	1 ft. 9 in.
Stroke	1 ft. 10 in.
Centres	6 ft. 5 in.
Steam ports	19 in. × 1⅝ in.
Exhaust	19 in. × 3 in.
Lap of valve, outside	1¼ in.
Throw of eccentric	5⅛ in.
Travel of valve, maximum	7 in.
Type of valve gear	shifting link.
Lap of valve, inside	⅛ in. negative.
No. of driving wheels	4
Diameter of driving wheels	5 ft. 8½ in.
Total wheel base	21 ft. 1 in.
Rigid " "	7 ft.
No. of truck wheels	4
Diameter "	2 ft. 9 in.
Centres "	6 ft 2 in.
Centre of main driving wheel to centre of truck	11 ft.
Material of wheels under engine truck	C. I. centre, steel tired.
Diameter of boiler at smokebox, outside	4 ft. 9¼ in.
Diameter of boiler at dome, outside	4 ft., 10⅜ in.
Diameter of dome, outside	2 ft. 4½ in.
Distance from top of waist to dome joint	2 ft. 3½ in.
Thickness of boiler at dome	⅜ steel.
Thickness of boiler at front course	7/16 steel.
No. of flues	324
Diameter of flues, outside	1½ in.
Length of flues	9 ft. 2¼ in.
Thickness of flue sheets	½ in. steel.
Heating surface in flues	1,158 sq. ft.
Heating surface, total	1,363 sq. ft.
Fire area through flues	452 sq. in.
Horizontal seams of boiler	triple riveted.
Circumferential of boiler	double riveted.
Length of firebox inside	9 ft. 6 in.
Width " "	8 ft. ½ in.
Length " " outside	10 ft. 4⅜ in.
Width " " "	8 ft. 8½ in.
Length of combustion chamber	2 ft. 9½ in.
No. of water bars	24
Diameter of bars outside	2 in.
Distance from top of grate to bottom of fire door	4½ in.
Distance from top of grate to crown (f)	2 ft. 10⅛ in.
Distance from top of grate to crown (o)	2 ft. 3½ in.
Thickness of inside firebox sheets	5/16 steel.
Thickness of outside firebox sheets	5/16 steel.
Diameter of stay bolts in firebox	¾ in.
Diameter of stay bolts in crown sheet	⅞ in.
Grate area	76 sq. ft.
Distance from rail to centre of boiler	8 ft. 3⅞ in.
Working pressure of steam per sq. in.	160 lbs.
Factor of safety	6
Total weight of engine	107,184 lbs.
Weight on truck	34,720 "
" " drivers	72,464 "
Total weight of engine and tender	172,184 "
Diameter of driving axle bearing	8½ in.
Length " " " "	1 ft. ⅛ in.
Diameter of main crank pin	5¼ in.
Length " " " "	5 "
Diameter of truck axle bearing	5¼ "
Length " " " "	10 "
Extreme length of engine	34 ft. 8¼ in.
" height "	14 " 3 "
" width "	9 " 0⅝ "
Total length of engine and tender	59 " 4¾ "
" wheel base of " "	47 " 2¾ "
Gauge	4 ft. 8½ in.
Type of truck	Rigid centre.
Kind of frames	Solid.
Distance between centres of frames	3 ft. 9 in.
Reverse	Steam.
Slide valve	Richardson.
Engine fitted with driver brake	
Capacity of tender for water	4,000 gals.
Capacity of tender for coal	3 tons.
No. of truck wheels	8
Diam. of truck wheels	33 in.
Total wheel base	16 ft. 11 in.
Material of wheels under tender truck	"Boise" pla e, tired
Diam. of tender truck journals	4½ in.
Length	7¾ in.
Extreme length of tender	24 ft. 8½ in.
Weight on front truck, loaded	33,750 lbs.
Weight on back truck, loaded	31,250 lbs.
Total weight of tender	65,000 lbs.

The Pennsylvania Ticket-Receiver System.

BY M. RIEBENACK, ASSISTANT COMPTROLLER, P. R. R.

On the Pennsylvania lines both east and west of Pittsburgh there are located at points where the runs of a number of passenger conductors terminate certain offices known as ticket receivers' offices, the ticket receiver acting as a representative of the accounting, passenger and transportation departments to the extent of the authority with which they invest him. There are 13 of these offices on the lines east of Pittsburgh and 17 on the lines west of Pittsburgh.

The idea originated with the Pennsylvania in 1875, and in the following year the system was extended to cover the business on all Pennsylvania lines east of Pittsburgh. In 1883 and 1884 it was introduced on the lines west of Pittsburgh.

The necessity for some such system arose in anticipation of the large volume of passenger traffic incidental to the Centennial Exhibition of 1876, and it was foreseen that the number of employés qualified for train running, from both an accounting and a transportation standpoint, would not be sufficient to meet the demands. During the Centennial year many freight conductors had to be placed in charge of passenger trains, and, while they met the requirements of one branch of the service, they were entirely unfamiliar with anything pertaining to the validity and handling of tickets or cash collections on trains. To obviate this, men who were designated as train agents were placed on trains for the purpose of securing the equivalents for passage, while the freight conductors gave their attention exclusively to the movement and safety of the train. These train agents were unacquainted with railroad transportation, but were selected with a view to their business qualifications, and they were instructed in regard to the validity of tickets and on other questions arising in connection with the passage equivalents; and competent men, selected from the general office staff, were placed in charge of ticket receivers' offices to receive collections from conductors and train agents, make up statements and reports to the auditor, and adjust differences with passengers which were unavoidable under the pressure of so large a business of a new character coming on the line suddenly. The success of the system was marked from the beginning, and the utilization of its capabilities have been gradually expanded until these offices have reached such a degree of usefulness as to make them almost indispensable to the proper, prompt and economical conduct of the business assigned to them. The train agents were relieved after the temporary pressure abated.

The general plan for the operation of all these offices is the same. They are usually open on the arrival and departure of all trains (some being open continuously) to receive the reports and collections of conductors, who, as a rule, are required to deliver the same to the ticket receiver immediately after arrival. Conductors on branch lines forward their collections daily by train service or express, to the nearest ticket receiver, so that the returns of all conductors are handled through these offices.

The money which is delivered by the conductors to the ticket receivers is banked by them daily, and advice of the total amount is sent to the auditor direct. The cash deposited in bank to the credit of the company is accompanied by a memorandum, which is verified by the bank officials and forwarded by them to the treasurer, for comparison with the advice received by the auditor. The ticket receivers are bonded to the company in amounts proportionate to the extent of business handled.

The ticket receivers forward to the auditor, daily, a statement of the amounts of cash deposited by each conductor, which is compared with the totals shown on conductors' reports, one of which must be made for each train on which passengers are carried.

The condensing of the deposits of the money collected by a large number of conductors of varied abilities (there are about 600 passenger conductors on the Pennsylvania lines east of Pittsburgh) is an important item, the depositing and accounting, daily and monthly, for all of such being now done by thirteen ticket receivers, instead of by each individual conductor as under the old system.

The conductors' reports, after being carefully examined, and the tickets of the several classes and kinds assorted and arranged to facilitate their distribution in the auditor's office, are forwarded to the latter daily. Statements of ticket mileage on trains are made by conductors and condensed into one daily statement by each ticket receiver and forwarded to the auditor's office, these forming a basis on which are calculated the earnings of the respective trains. These figures are quickly available to superintendents in arranging for running trains so as to secure the best results, and they are also used in arriving at an estimate of the weekly passenger earnings.

The experience of the Pennsylvania Railroad, where an estimate of the weekly earnings has always been furnished by the auditor, shows that it would require a larger clerical force to make this estimate in the auditor's office than is employed in the ticket receivers' offices to accomplish the same results. To promptly furnish the transportation department with the earnings of each train by compilations in the auditor's office was found to be practically out of the question. The work assumed such extensive proportions that with the best efforts of a large additional office force specially engaged for the work, it was found impossible to complete this information within three months, making the statistics so old that their value, as a guide as to whether the running of certain trains was warranted by their earnings, was considerably impaired.

Under the present plan the statement of earnings of each of the 2,200 daily passenger trains on the lines east of Pittsburgh can be furnished to the transportation officers within two weeks after the close of the month, and in case of new trains, which are placed in service to fill an apparent want, the earnings can be furnished from day to day, if necessary, and an early conclusion reached as to the wisdom of continuing them.

It should be borne in mind that the adoption of such a complete and comprehensive system for the handling of the passenger business is only economical on roads doing a large traffic, and which must have estimates of their weekly passenger earnings as well as the earnings of different trains. The value of the ticket receivers' offices to the auditor is in the *consolidation of returns*, which is done in a much more economical manner than if the same work were done in the auditor's office.

These offices are depots of supplies for tickets, blanks and stationery required by conductors, and ticket receivers issue these as necessary, and see that such supplies are properly used and accounted for. They also attend to the keeping in order of conductors' equipment, and are watchful, in the interests of the company, o matters connected with business transacted through their offices. Orders and instructions relating to tickets and matters pertaining thereto are communicated to conductors through ticket receivers, and useful information and explanations received from conductors are made known to the general office through the same channel.

Ticket receivers, to produce satisfactory results, need to be well versed in all the rules and regulations of the departments connected with the business of passenger transportation, have a geographical knowledge of railroads and connection points, and possess good judgment, so that any decisions they may make pertaining to the validity of tickets, or other matters about which there may be a disagreement among passengers and conductors shall be equitable as between the passengers and the company.

Candidates for the position of passenger conductor after having passed the thorough examination required by the transportation department, in regard to running of trains, etc., must, before they are considered available for appointment, also pass a satisfactory examination in the auditor's office in relation to ticket and accounting matters, after having been fully instructed therein.

It will be seen from a perusal of the foregoing that the ticket receiver system is specially applicable and advantageous where passenger trains are numerous, and close watch is kept by the management on their earnings; also on lines, where, by reason of the use of the great number of different kinds of tickets, apparently made necessary by the modern customs of ticketing passengers, and of possible complications and misunderstandings, it is a matter of policy to have a representative at important points to promptly decide disputes.

Other large systems are availing themselves of the advantages to be derived from such offices. The Central of New Jersey has recently established one at its terminus at Jersey City, and the New York Central & Hudson River has one at the Grand Central Depot in New York City and also one at Syracuse, N. Y.

Buildings and Structures of American Railroads.*

NO. 16—ENGINE HOUSES.

BY WALTER G. BERG, C. E.

(*Continued from page* 188.)

Engine House at Mt. Pleasant Junction, Jersey City, N. J., Pennsylvania Railroad.—The engine house shown in figs. 1 and 2 was built in 1890 under the direction of Mr. E. F. Brooks, Engineer Maintenance of Way, P. R. R. It is a full circle, 44-stall, brick roundhouse, with combination roof trusses and slate roof. The outside diameter of the house is 320 ft., the inner diameter is 168 ft. 6 in. and the diameter of the turntable pit is 60 ft. The width of the house is, therefore, 75 ft. 9 in., and the space between the turntable and the inner circle of the house is 54 ft. 3 in. The angle of the stalls is 8° 10′ 54″. The panel length of the inner circle is 12 ft. ⅛ in. and on the outer circle 22 ft. 9 13/16 in. The clear width of the interior of the building, measured on the centre line of the stall, is about 74 ft., and the clear height from the top of rail to the tie rod of roof truss is 22 ft. Two of the stalls are used for entrance tracks, with brick fire walls on each side of the track, the passage being 12 ft. inside in the clear; all the other stalls have engine pits. The foundations of the building are of stone. The outer wall above the foundation masonry is of brick, built without panels on the outside, but with pilasters on the inside under the trusses, and with a plain but ample brick cornice on the outside. The brick wall is 12 in. thick between the pilasters and 20 1/16 in. thick at the pilasters.

The floor is of asphalt, level with the top of the rails. The engine pits in the stalls are 45 ft. 8 in. long in the clear by 3 ft. 11 1/16 in. wide in the clear, 2 ft. 9 in. deep at front, and 2 ft. deep at back. The upper end of the pit is placed 13 ft. from the inside of the outer wall. The side walls are stone, 2 ft. thick. The bottom is laid with a slope from the centre of the pit down each way toward each side wall along which gutters are formed thus keeping the middle of the pit dry. The pits are paved with brick set on edge and grouted with cement, and drain at the lower end through a 10-in. bell trap with cesspool and cast iron grate into a 12-in. circular brick sewer running under the ends of all the pits and discharging into the main sewer leading from the house.

The side walls of the pits extend all the way across the house so as to provide a support for the rails. The rails are spiked to 8 in. × 12 in. white oak stringers anchored with ⅞ in. bolts every 4 ft. to the stone side walls.

The roof trusses are built on the triangular system, of iron and wood, the span being 75 ft. 1 in. from centre to centre of end pins, with a rise of 18 ft. 8 in. The cast iron end plate on the inner front is firmly fixed to the top of the column, while at the outer front it rests on a 4 in. × 14 in. × 2 ft. 6 in. white oak wall plate. The purlins are sheathed with 1¼-in. hemlock, covered with slate laid on two layers of roofing felt. Gutters of tin are provided on the outer and inner fronts.

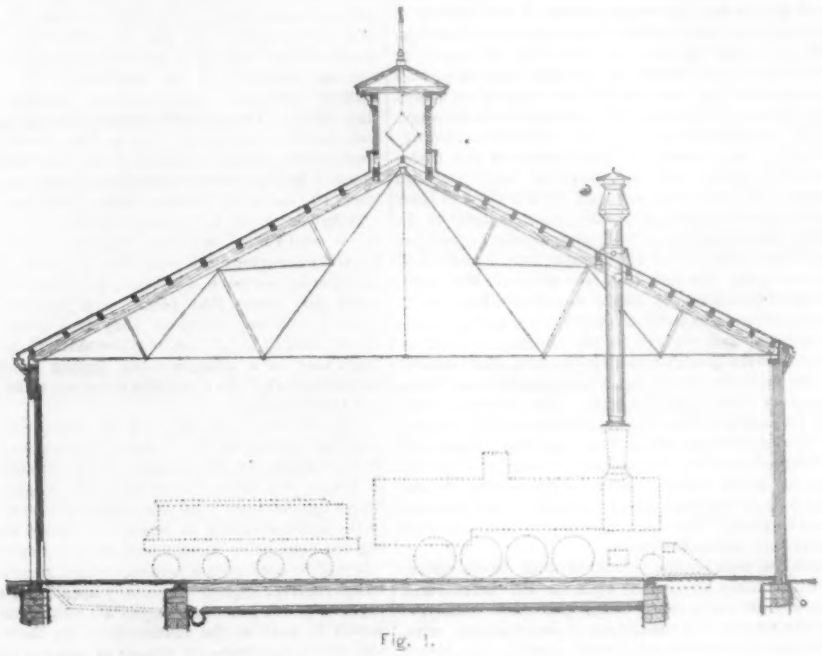


Fig. 1.

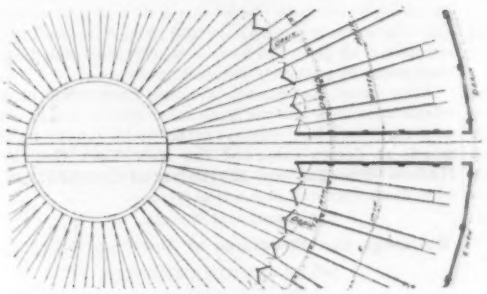


Fig. 2.

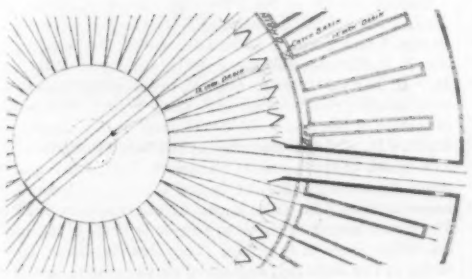


Fig 6.

Ventilation is secured by 6 ft. octagonal, ornamental, louvered ventilators, placed in ridge of roof on every alternate stall. A sheet iron smoke flue is placed over every stall, the centre of the flue being 15 ft. from the inside face of the outer wall. The flue is about 20 in. in diameter with a cast iron stack of "None Such" patent at the top and provided at the lower end with a bell shaped, movable hood, the bottom of the hood, when raised, being 15 ft. 2 in. above the top of rail and 14 ft. when lowered. Waterplugs, with 3 in. standard fire hose connection, under the floor protected by cast iron boxes and covers level with top of floor, are provided at the centre of the house in alternate stalls, connected by a 6-in. waterpipe and supplied by an 8-in. watermain.

Four hydrants are located inside the house along the outside wall. The heating of the building is done by steam, and the ventilators in the roof can be closed by flap doors, as shown on the plans.

Between the house and the turntable the rails are laid on oak ties in stone ballast. The frogs around the turntable are rail frogs bedded on oak ties in ballast, the points of the frogs being 3 ft. 3_{16} in. from the face of the turntable pit. The turntable pit is drained through a pipe drain to the main sewer. The turntable pit is 60.6 ft. diameter in the clear. The turntable is of wrought iron and is turned by steam power.

Engine House at Lehighton, Pa., Lehigh Valley Railroad.—The engine house shown in fig. 3, built in 1883 under the direction of the writer, is a 29-stall segment of a full circle 56-stall, stone round house, with iron trusses and slate roof. The outside diameter of the house is 354 ft., the inner diameter is 206 ft., and the diameter of the turntable pit is 60 ft. The width of the house is, therefore, 74 ft., and the space between the turntable and the inner circle of the house is 73 ft. The angle of the stalls is 6° 40′. The panel length on the inner circle is 12 ft. and on the outer circle 20 ft. 7¼ in., measured on the centre line of the wall. The clear width of the interior of the building, measured on the centre line of the stall, is 72 ft., and the clear height from the top of rail to the tie rod of roof truss is 21 ft. 2 in.

The foundations and walls of the building are throughout of stone.

The floor consists of 6 in. to 8 in. limestone flagging, set in sand and well grouted at joints. The floor is level with the base of the rails at the pits and is slightly pitched between the pits, so as to afford better drainage. The engine pits are 54 ft. long in the clear by 3 ft. 11 in. wide in the clear, 2 ft. deep below base of rail at front and 1 ft. 6 in. deep at back. The upper end of the pit is placed 9 ft. from the inside of the outer wall. The side walls of the pits are stone, 2 ft. thick. The pits are paved with stone paving and dished from the side walls towards the centre of the pit. The drainage passes at the lower end of the pit through a cesspool with cast iron grating into a 6-in. pipe leading into a stone box sewer, 2 × 3 ft., which serves as the main sewer of the house, taking the water from the down conductors of the inner slope of the roof and the drainage from the turntable pit. The side walls of the pits are coped with stone, the top being flush with the stone floor of the house. The side walls of the pits extend across the house, so as to provide a support for the rails between the pits and the outer walls of the building. The rails rest on the stone coping and are held down and in place by rag bolts and cast iron rail clips.

The roof trusses are built of iron, on the triangular system, the span being 73 ft., 6 in. from centre to centre of end pins with a rise of 19 ft. The bed plate on the inner front is firmly fixed to the top of the column, while at the outer front it rests on a white oak wall plate. The roof sheathing is 1-in. Michigan pine, tongued and grooved, and covered with slate laid on two layers of roofing felt.

Ventilation is secured by 6-ft. octagonal, ornamental, louvered ventilators, placed in ridge of roof on every third stall. The smoke flue for carrying off the gases and smoke from the smokestacks of the engines standing on the pits, is quite a novel feature in this building, being the application on a larger scale of a system of overhead horizontal pipe ventilators introduced by Mr. David Clarke, Master Mechanic, L. V. R.R., in an engine house at Hazleton, Pa. A 33-in. horizontal iron pipe, connecting outside of the building with a brick stack, is hung from the roof trusses over the pits, the centre of the pipe being 13 ft. from the inside face of the outer wall, and 17 ft. 8 in. above the top of the rails. Over each pit this pipe has a vertical tube with a damper and a bell-shaped end to fit over the smokestack of the engine below it. The draft, created in the brick stack outside of the house, causes the gases and smoke in the smokestacks of the engines to be drawn into the ventilating tube, and thence out of the house. The system works very well in this house. The brick stack is 100 ft high, and the smoke is drawn from engines 500 ft. distant from the stack.

Water plugs are provided throughout the house at convenient points. The heating of the house is done by steam coils hung from the roof trusses overhead. This system is excellent, as far as producing a uniform heat throughout the lower part of the building, but it is accompanied with considerable waste of heat.

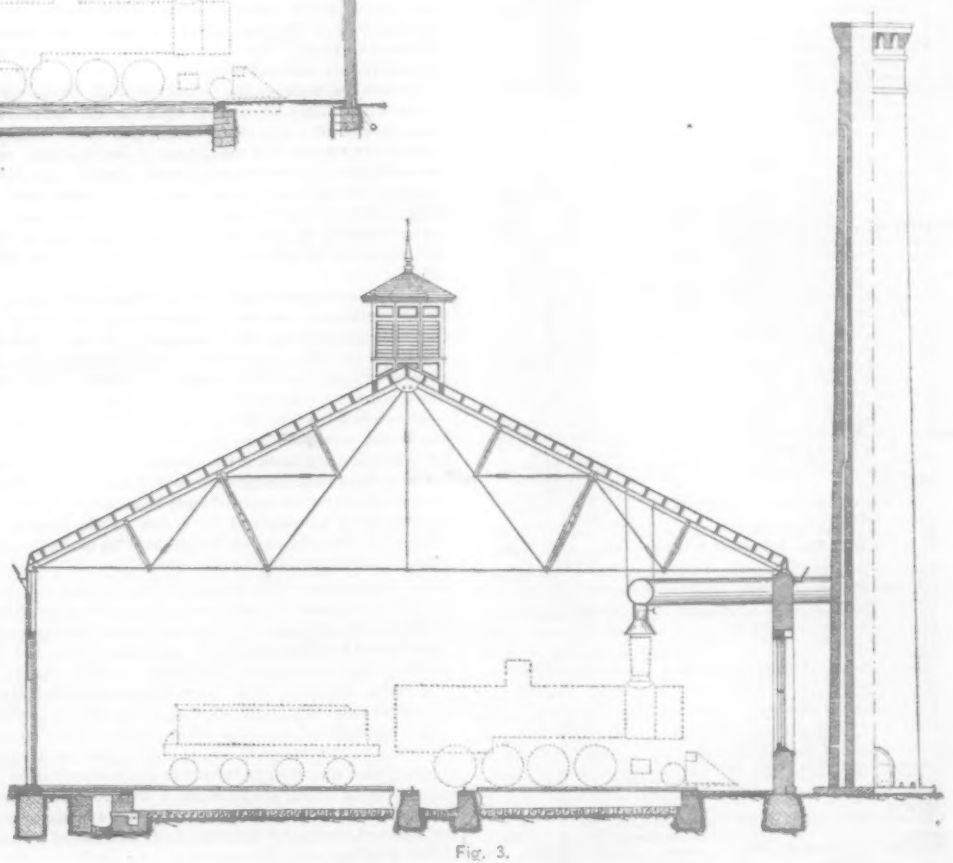


Fig. 3.

Between the house and the turntable the rails are laid on oak ties in stone ballast. The frogs around the turntable are steel rail frogs bedded on stone walls connecting with the outside wall of the turntable pit. The points of the frogs are 10 ft. 5⅛ in. from the face of the turntable pit. The walls of the turntable are of stone, 2 ft. 6 in. thick, coped with 12 in. × 30 in. coping, and with a 3 ft. offset or bench for the circular rail of the table. The centre pivot of the table rests on a 4 ft. square pedestal stone, 18 in. thick, with a stone pier foundation under it, 7 ft. square at its bed. The pit is paved with brick, and drains into the main sewer of the building. The turntable is of wrought iron and is turned by hand. The circular rail rests on cast iron chairs, the base of the rail being 7 in. above the stone coping of the bench wall under the chairs. This construction makes the pit deeper, but it allows the turntable to be operated after a light snowfall without waiting to have the snow shoveled out of the pit.

Engine House, Northern Pacific Railroad.—The engine house of the Northern Pacific, shown in fig. 4, designed by Mr. C. B. Talbot, is a segment of a full circle,

51-stall frame roundhouse, with wooden roof trusses. The outside diameter of the house is 351 ft. 6 in., the inner diameter is 211 ft. 6 in,, and the diameter of the turntable pit is 50 ft. The width of the house is, therefore, 70 ft., and the space between the turntable and the inner circle of the house is 80 ft. 9 in. The panel length on the inner circle is 13 ft. 5⅛ in., and on the outer circle 21 ft. 6 in. The clear width of the interior of the building is 68 ft., and the clear height from the top of rail to the tie beam of roof truss is 21 ft. 8 in.

The foundations of the building are stone or brick piers or blocking, according to circumstances. The posts between the doors of the inner face and at the panel points of the outer wall are 10 in. × 10 in.; plates, 10 in. × 10 in.; studding of outside walls and gables, 2 in. × 5 in.; rafters, 3 in. × 8 in.; purlins, 6 in. × 12 in.; tie beam of roof trusses, 3 pieces, 4 in. × 12 in.; principal rafters, 10 in. × 12 in.; struts, 6 in. × 12 in. and 4 in. × 12 in. The floor consists of 2-in. rough boards on 3 in. × 12 in. joists, spaced 20 in., which latter rest on 4 in. × 14 in. girders, spaced 6 ft., spanning the space between the pits. The pits are of timber, 4 ft. wide by 54 ft. long in the clear, and 3 ft. deep. The rise of the roof is one-third of the span.

Engine House at Grand Crossing, Wis., Chicago, Burlington & Northern Railroad.—The engine house shown in figs. 5 and 6, plans for which were kindly furnished by Mr. H. S. Bryan, Master Mechanic C., B. & N. R. R., is a full circle, 40-stall brick roundhouse, with a low, flat, girder roof, resting on cast iron posts in the interior of the building, covered with a gravel roof. The outside diameter of the house is 304 ft., the inner diameter is 160 ft. and the diameter of the turntable pit is 60 ft. The width of the house is, therefore, 72 ft., and the space between the turntable and the inner circle of the house is 50 ft. The angle of the stalls is 9 degrees. The panel length on the inner circle is 12 ft. 6 in. The clear height from the top of rail to the roof girder at the outer walls is 18 ft. Two of the stalls are used as passage ways, with brick fire walls on each side.

The foundations of the walls are of stone. The outer wall is of brick, paneled on the outside, and with pilasters at the angles on the inside and outside of the wall, the thickness of the wall at the pilaster being 2 ft.

The peak of the roof is placed, as shown in the plans, nearer the outer wall, the inner slope has a pitch of 1 in 12, the outer slope a pitch of 1 in 6. The roof girders are supported inside the house by two 6-in. cast iron columns, ⅝ in. metal. The girders are two pieces 6 in. × 16 in. The purlins are 2 in. × 10 in. spaced from 12 in. to 16 in. apart. The roof is covered with four-ply roofing felt and gravel, on 1 in. boards. The engine pits are 50 ft. long by 3 ft. 10 in. wide, and from 2 ft. 10 in. to 3 ft. 4 in. deep below the top of the rail. The pits are built with a foundation of stone flagging; the side walls are built up on this foundation for about 1 ft. in height with brick, and for the balance of the height with timber, the rail being spiked to the top timber. The bottom of the pit is paved with concrete, built convex, so as to form a drain along each sidewall. The drainage of the pits is very thorough through a cesspool and brick and timber culvert.

Engine House at Beardstown, Ill., Chicago, Burlington & Quincy Railroad.—The engine house shown in fig. 7, plans for which were kindly furnished by Mr. Wm. Forsyth, Mechanical Engineer, C., B. & Q., is an 18-stall segment of a 30-stall brick roundhouse, with a low, flat, girder roof resting on timber posts in the interior of the building, and covered with a tarred gravel roof. The outside diameter of the house is 256 ft., the inner diameter is 120 ft., and the diameter of the turntable is 60 ft. The width of the house is, therefore, 68 ft., and the space between the turntable and the inner circle of the house is 30 ft. The angle of the stalls is 12 degrees. The panel length on the inner circle is 12 ft. 6 in., and on the outer circle 26 ft. 7 in. The clear height from the top of the rail to the roof girder at the inner wall is 18 ft.

The foundations of the wall are of stone, and the outer wall is of brick, 13 in. thick, paneled on the outside, and with pilasters at the angles on the inside and outside of the wall, the thickness of the wall at the pilasters being 26 in. There are two windows in each panel of the outside wall, each window having 24 lights, 12 in. × 18 in. The inner front consists of cast iron columns between the doors, the door opening being spanned by a cast iron lintel.

The roof is a single pitched roof on a slope of 1 in 12 the highest point being at the outer wall. The roof girders are supported inside the house by two 10 in. × 10 in. timber posts, with cast iron bedplates resting on 12-in. stone pedestals with a stone foundation 4 ft. 9 in. square, The girders are two pieces, respectively, 6 in. × 16 in., 7 in. × 16 in., and 8 in. × 16 in., for the three spans starting from the inner wall to the outside of the building. The purlins are 2 in. × 12 in., and 3 in. × 12 in., spaced to suit the span. The roof is covered with ⅞-in. boards and a tarred graveled roofing felt.

The engine pits are 52 ft. 8 in. long by 3 ft. 10 in. wide in the clear, and from 2 ft. 8 in. to 3 ft. 2 in. deep below the top of the rail. The pits are built with a convex bottom, so as to throw the water toward each side wall. The top of the walls is covered with a 12 in. × 12 in. wall plate to which the rail is spiked, the top of the rail being level with the floor of the house. The drainage of the pits is excellent, consisting of an opening at the lower end leading directly into a stone box sewer 33 in. wide, with a concave concrete bottom and covered with the floor timbers, making the sewer thus easily accessible for cleaning out and repairs. The flooring in the house consists

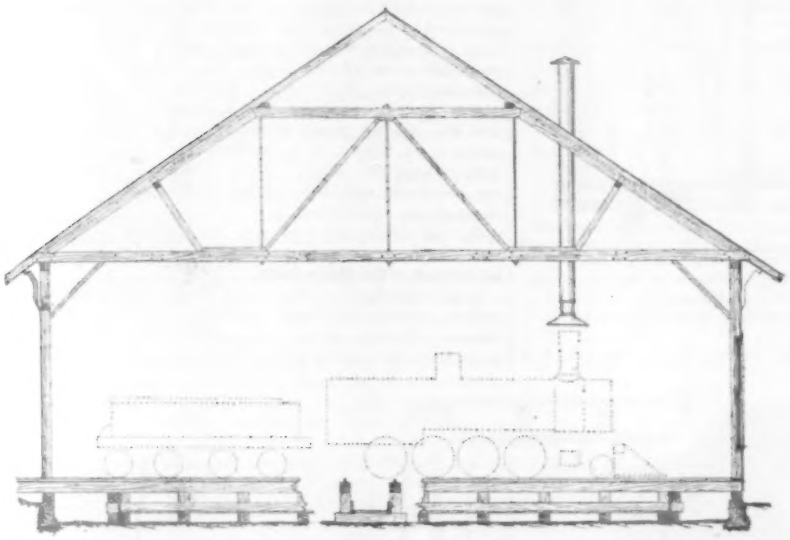


Fig. 4.

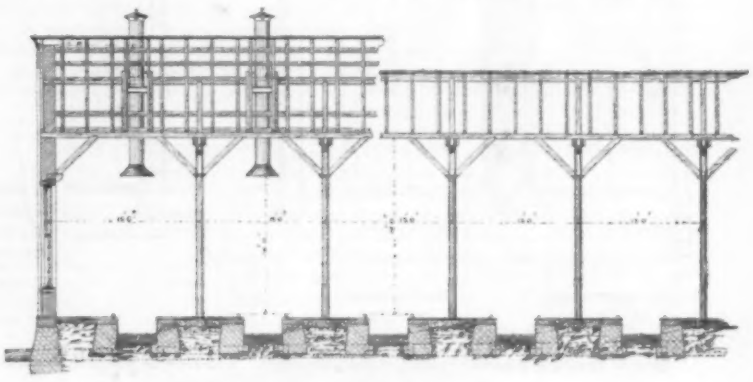


Fig. 8.

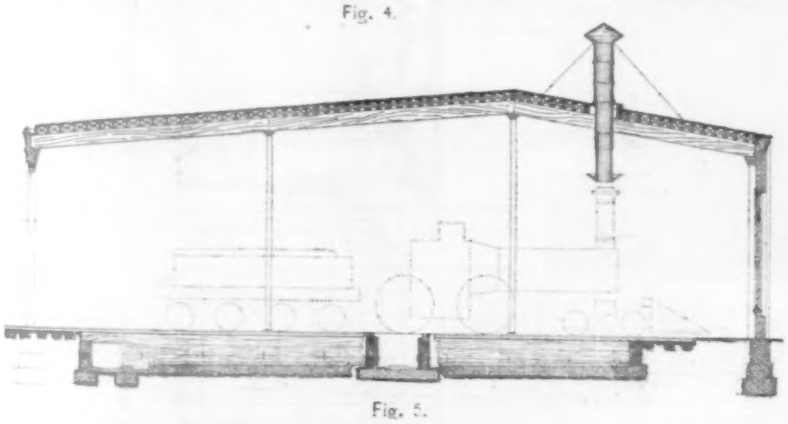


Fig. 5.

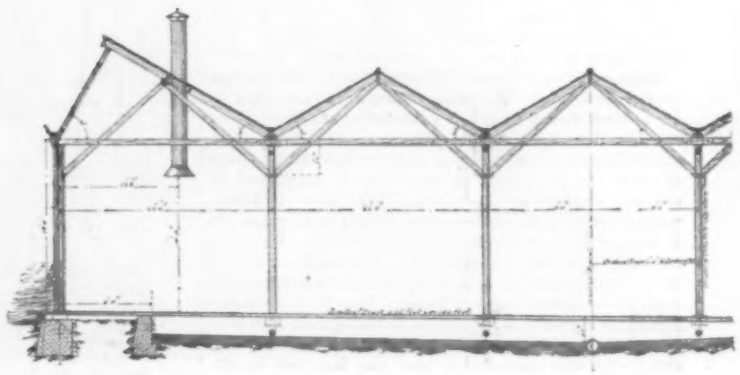


Fig. 9.

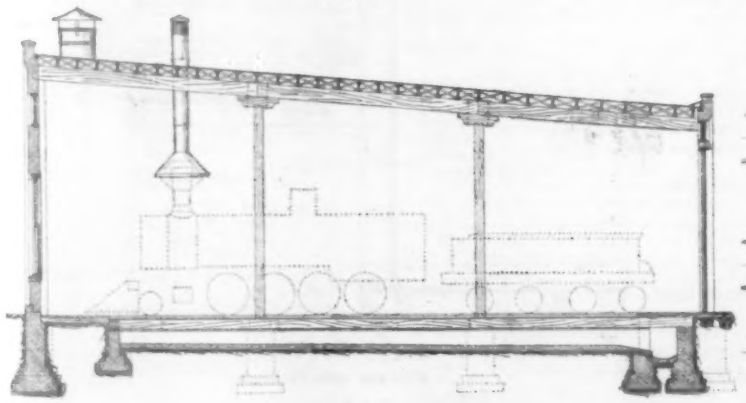


Fig. 7.

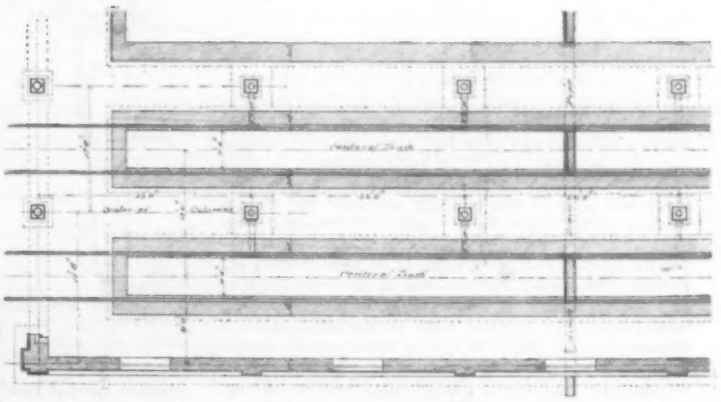


Fig. 10.

STANDARD AMERICAN ENGINE HOUSES.

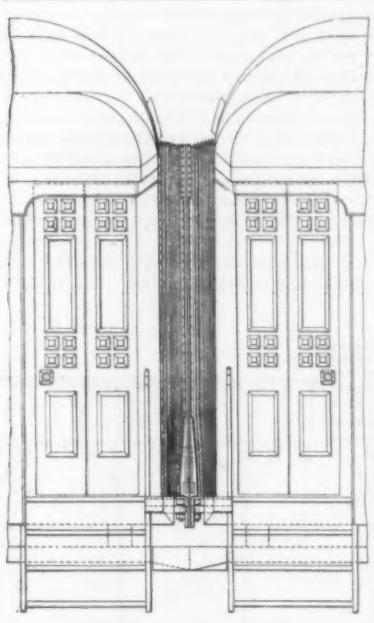


Fig. 5.

Side of Vestibule When Cars are Coupled Together.

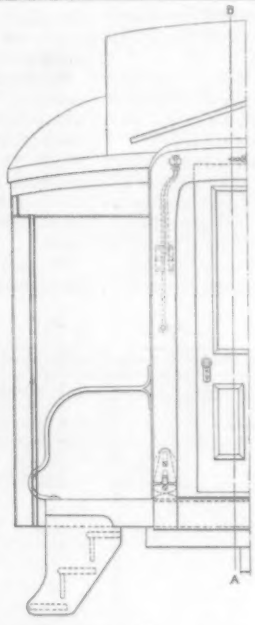


Fig. 6.

End View of Car with Vestibule.

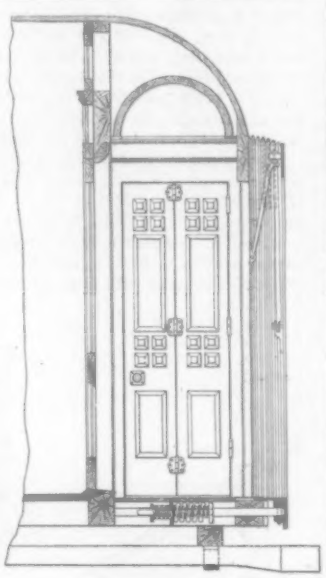


Fig. 7.

Vertical Section on Line A B.

cars by friction, but clutch automatically and remain in position while the cars are running. These face plates are hinged at the bottom and have a link motion which permits them to oscillate laterally. The plates can so yield in going around reverse curves that they steady the cars and do not rub upon each other. There are no springs at the top of these plates; they hang on a support and press together by their own weight. So far it has been shown from service that this vestibule is tightly closed at all times, and there is no danger of injuring or cutting off the fingers of passengers by the sidewise shearing motion or opening and shutting of the plates. These vestibules interchange with the Pullman type and others in use in this country.

The general construction is as follows: There is a face plate *A*, which is hinged at the centre and ends and governed by the springs at three points in such a way that it is automatically pressed against the opposing vestibule under all conditions. Fig. 1 shows the platform and buffer adapted for a vestibule and fig. 2 for cars without a vestibule. The location of the springs and the chafing plates are shown in figs. 3 and 4. The springs are shown in a position when the cars are coupled together. Figs. 5, 6 and 7 show the exterior of the vestibule and the chafing plates, and a section through one vestibule.

The engravings show not only the platform and vestibule but the arrangement for the use of the Gould coupler instead of the Miller hook.

It is noticeable that the recent designs of vestibules contain several important improvements. There is in them a reduction in the cost and weight, which will bring them into more general use. This platform and

of 2-in. plank laid on mudsills. The ventilation is effected at the high end of the roof next to the outer wall by a 3 ft. 4 in. round sheet iron ventilator in the roof over each stall. There is also a smokestack with a movable bell-shaped lower piece hung in the roof, the centre of the stack being 14 ft. 4 in. from the inner face of the outer wall.

Engine House at East Mauch Chunk, Pa., Lehigh Valley Railroad.—The engine house of the Lehigh Valley at East Mauch Chunk, Pa., designed and built under the direction of the writer, assisted by Mr. F. E. Shall, shown in figs. 8, 9 and 10 is a large, square engine house of brick, with a system of broken roofs supported on columns throughout the house. The house is 114 ft. wide by 132 ft. long, and has nine stalls running through it, each stall, accommodating two engines, so that the capacity of the house is 18 engines. The stalls are spaced 12 ft. centres, and there are engine doors opposite each stall at both ends of the house. There is a track approach at each end of the house, so that engines can pass in and out at either end of the building. The choice of this design was necessitated from the fact that the engine house in question had to be built in a narrow mountain gulley. The track approach from one side of the house, if necessary, would have answered, but it was thought best to have approaches at both ends, so as to facilitate the movement of engines.

The foundations of the walls are of stone. The side walls are of brick, 17 in. thick, with pilasters. The posts between the doors are cast iron segmental columns. The posts in the interior of the house are cast iron, round hollow columns, resting on cast iron hollow bed plates, the whole being so arranged that the drainage from the valleys between the broken roofs is taken down through the iron columns and pedestals to a drain pipe, leading into the adjacent pits. The roofs are built in 22-ft. spans, running across the building. The roofs at the front and back of the building are built on what is known as the "saw tooth" principle, the long slope forming an angle of 30 degrees with the horizon, the front slope being set at an angle of 60 degrees with the horizon. Windows are inserted in the front slope, so that a large amount of light can penetrate the interior from above. The interior roofs in the building under discussion were built as plain, symmetrical double pitched roofs, but, in the original design, the intention was to have "saw tooth" roofs throughout the building, which is the best method of any known to the writer to cover a large square building cheaply. This system offers the advantage of good ventilation and an excellent diffused light from above throughout the building, in addition to the feature that, the roof being low, the building is easily heated in winter. The objection to the fact that snow, in winter, lodges in the valleys between the roofs, and freezes solid in the gutters, is overcome in practice in this house, and in other places known to the writer, by inserting a small steam-pipe along each valley. Where the house is heated by steam, as in the building at East Mauch Chunk, the small amount of steam required to thaw out the gutters, or keep the water from freezing, is inappreciable. The pits are 112 ft. long by 4 ft. 11 in. wide in the clear, and from 2 ft. 4 in. to 3 ft. deep below the top of the rail. They are drained near the centre of the pit across the house, from pit to pit, by a 12-in. iron drain pipe, connecting cesspools formed in the paving of each pit on the line of the pipe. The pits are built with stone sidewalls, coped with stone slabs, to which the rails are fastened with clip rag bolts. The floor is cement on gravel. The roof trusses are very light, and braced both ways, so that the entire structure is very stable. Iron smokestacks are inserted at the proper points to suit the smokestacks of engines standing over the pits.

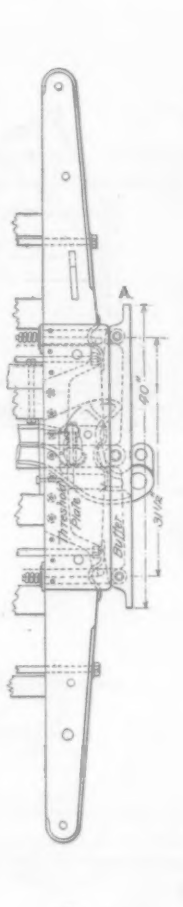


Fig. 2.

Platform without Vestibule.

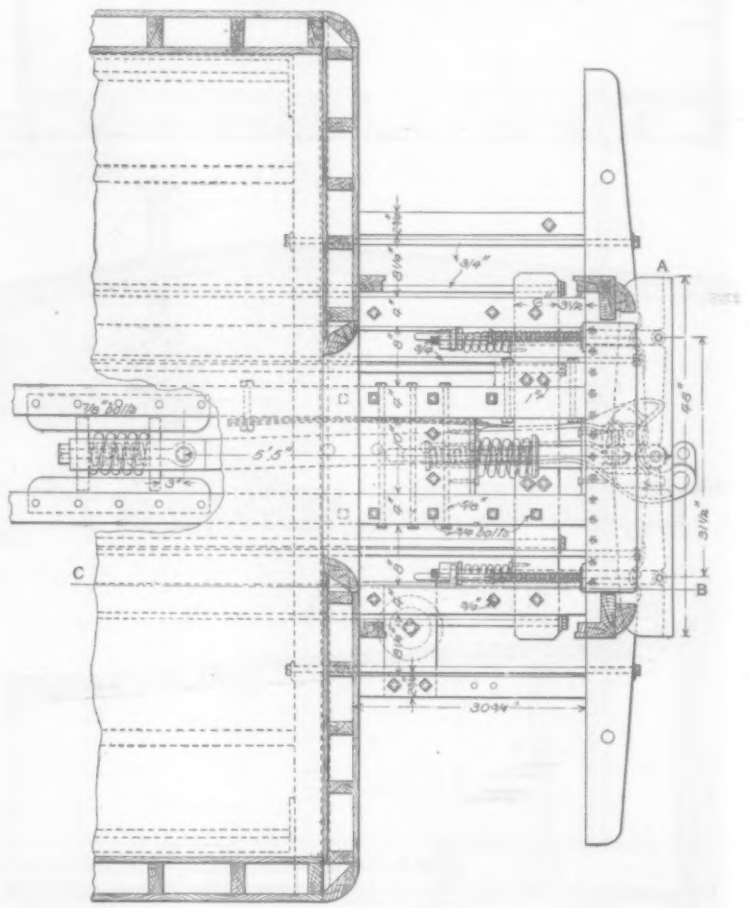


Fig. 1.

Platform with Vestibule.

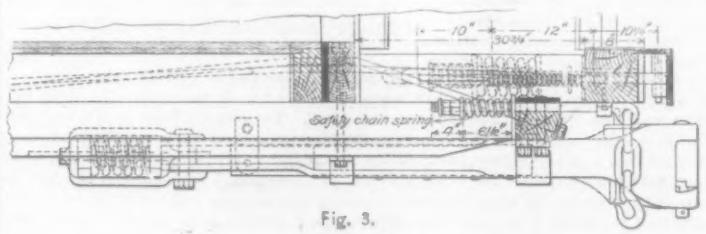


Fig. 3.

Section B C.

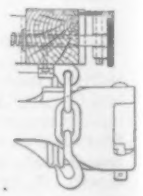


Fig. 4.

THE BISSELL "GOULD" PLATFORM AND VESTIBULE.

The "Gould" Vestibule and Platform.

Mr. T. A. Bissell, General Manager of the Wagner Palace Car Co., has designed a vestibule and platform which are sold under the above name and which have some decided advantages. The details are shown in the accompanying cuts. The improvements are: The platform is continuous at all times and is adapted for use on cars which do not have vestibules. The face plates of the vestibule do not rub against each other and steady the vestibule are manufactured by the Gould Coupler Co., of Buffalo, N. Y.

The Morton Heater.

The Morton car heating apparatus, a continuous system, which was described in the *Railroad Gazette* April 17 last, was tested in a train accident on the Baltimore & Lehigh road on the afternoon of March 3 in a way which gave very good evidence of its safety quali-

ties and of the strength of the claims made by its manufacturers. A train on this road (narrow gauge) which was approaching a trestle over the Little Gunpowder River, near Baldwin, Md., 17 miles from Baltimore, was derailed and the baggage car and one passenger car were thrown down a bank. The train was running very slowly, and the cause of the derailment is supposed to have been some breakage in the trucks of the baggage car. This car in its fall pulled the engine with it and the engineer was killed. The express agent and mail agent were badly hurt and several passengers somewhat injured.

The passengers in the smoking car, two of whom were railroad men (connected with other roads) and men qualified to form correct opinions, spoke especially of the entire absence of steam and hot water. The moment they recovered from the shock of the fall they were enabled to take an intelligent survey of their surroundings and at once take measures to extricate themselves. The baggage car was heated by a stove, which was overturned and immediately set fire to the car, and this tended, by contrast, to show more forcibly the advantage of the stored heat system in the passenger car. The fire in the baggage car was extinguished by the use of milk, with which the car was partly loaded. The General Manager of the road, Mr. Crumpton, states that there had been steam in the pipes of the car only a few minutes before the accident, but the separation of the connections between the cars resulted in the escape of no steam or hot water.

The distinctive feature of the Morton system is the earthenware tube inside the iron heating pipes, by which a large amount of heat is stored, to be given off gradually. Mr. Crumpton states that in practice he finds it necessary to turn steam into the pipes in the cars only while trains are standing at stations, the supply thus being taken from the locomotive when it would quite likely be blowing off. On Feb. 6, when the thermometer fell to zero, the train was heated in half an hour to 72 degrees, and it is stated that though the train was in service 11 hours on that day the total time that steam was applied was only 32 minutes. The wrecked train was equipped with the Gibbs' steam coupling, and the breaking apart of the cars resulted in the automatic uncoupling of all the couplers, so that not one of them was broken.

Inspection Locomotive.

The engraving printed herewith shows an inspection locomotive which has just been built at the Schenectady Locomotive Works for the Adirondack & St. Lawrence Railroad. It has been designed for the use of Dr. Webb, President of the road, and the cab, which is elegantly finished, has seating capacity for eight persons. The engine is designed to haul two sleeping cars at usual speed. The main dimensions and some of the specifications of this engine are shown in the following table:

Gauge of road	4 ft. 8½ in
Total weight of locomotive in working order	134,400 lbs.
" on drivers in working order	56,700 lbs.
" on front truck in working order	15,000 lbs.
" on back truck in working order	62,700 lbs.
Total wheel base	31 ft. 11 in.
Driving wheel base	7 ft. 6 in.
Rigid wheel base	7 ft. 6 in.
Wheel base of drivers and front truck	14 ft. 10 in.
Total length of engine over all	45 ft. 2 in.
Cylinders and valves:	
Diameter of cylinder and stroke of piston	16 × 22 in.
Horizontal thickness of piston	5¼ ins.
Diameter of piston rod	3 in.
Size of steam ports	14 in. × 1¼ in.
" " exhaust ports	14 in. × 2½ in.
Greatest travel of slide valves	5¼ in.
Lap of slide valves	outside, ⅝ in.; inside, 1/32 in.
Lead of slide valves in full stroke	1/16 in.
Wheels, etc.:	
Diameter of driving wheels outside of tires	60 in.
Driving axle journals	7 in. × 8 in.
Diameter of truck wheels	30 in.
Inside front truck axle journals	5 in. × 9 in.
Outside back truck axle journals	4¼ in. × 8 in.
Main crank pin journals	4½ in. × 5 in. and 4½ in. × 4½ in.
Front crank pin journals	4 in. × 3½ in.
Length of driving springs, centre to centre of hangers	36 in.
Boiler:	
Working pressure	160 lbs.
Diameter of first ring outside	44 in.
Fire-box, inside:	
Length	60 3/16 in.
Width	34⅜ in.
Depth	60½ in.
Steel plates in inside of firebox, thickness:	
Crown	⅜ in.
Tube	½ in.
Sides and back	5/16 in.
Tubes, of iron, number	146
Outside diameter	2 in.
Length, outside of tube sheets	11 ft. 7 in.
Heating surface in tubes	879.12 sq. ft.
" " firebox	91.77 sq. ft.
Total heating surface	970.89 sq. ft.
Grate surface	14.38 sq. ft.
Diameter of exhaust nozzles	3¾ in., 3½ in. and 3⅝ in.
Inside diameter of smokestack	14 in.
Smokestack, height above rail	14 ft. 9¼ in.

Additional details are as follows: Fuel, bituminous coal. The piston packing consists of cast iron rings. The packing of the piston rods and valves is the U. S. Metallic. The slide valves are Richardson balanced. The boiler is wagon top and the plates (steel) in the waist, and those in the outside of the firebox are 7/16 in. thick. The horizontal seams are quadruple riveted, with a welt strip inside, and the circumferential seams are double riveted. The water spaces around the firebox are: front, 4 in.; sides, 3 in.; back, 3 in. The crown sheet is stayed by crown bars 4⅛ × ⅝ in. welded at the ends. The engine has a rocking grate and the ash pan has dampers front and back. There are two injectors, placed right and left.

It will be observed that the coal and water is carried on an extension of the engine frame. The six-wheel truck at the rear is centre bearing with spring bolster. The wheel base of this truck is 6 ft. 6 in. The engine will carry about four tons of coal, and the capacity of the water tank is 2,300 gallons.

Care of Air Brake Equipment on Locomotives.

One result of the careful and systematic work of an air brake inspector on the Boston & Albany is the issuing of the following circular of instructions. The circular defines very particularly what are the defects to be looked for and reported. Enginemen are provided with blanks containing a list of possible repairs and on these they check the item to be attended to. These blanks eventually pass back from the machinist who makes the repairs, and the foreman, to the office of the Superintendent of Motive Power. The air brake inspector makes a daily report on a simple blank for each engine. The following is the circular mentioned:

It is very important that the air brake equipment on locomotives should be maintained in the best possible manner. To accomplish this, the standard of inspection must necessarily be high; therefore, to help you to bring the equipment up to this standard, the following defects, when they exist, must be reported by engineers and inspector of air brakes on blanks furnished them for that purpose:

1. When, with 125 lbs. steam pressure, the 8-in. pump will not compress from 20 to 70 lbs. pressure of air in main reservoir at the rate of 200 cubic inches per second.
2. When air valves have not proper lift.
3. When lubricator is not working properly.
4. When the brake valve handle is not working easily, and the stops, for various positions of handle, cannot be readily distinguished by feeling, as the spring on the handle approaches them.
5. When the engine is not coupled to cars, and the main reservoir pressure equalized with auxiliaries, the brake valve handle cannot be placed in "running position" and left in this position without the brake setting.
6. When, on account of leaks, a reserve pressure of 15 lbs cannot be maintained with brake valve handle in "running position."
7. When feed valve spring does not hold a reserve pressure of 15 to 25 lbs. in main reservoir.
8. When rotary valve leaks so, with brake valve handle on "lap," that it will release the brake after it has been applied, with a reduction of 10 lbs. or less. This applies to engine alone.
9. When the piston valve does not move freely, and close tight, with handle on "lap," after applying brake with a train.
10. When locomotive brakes are applied, with a reduction of 20 lbs. of air, and will not stay on at least five minutes and hold the shoes rigid against the wheels.
11. When the driver brake piston travel is less than 2 or more than 5 in.
12. When the tender brake piston travel is less than 6 or more than 10 in.
13. When any of the levers strike or catch on tender or truck frame, or the levers or pistons do not return promptly to their place after the air is released.
14. When any of the brake shoes, heads, rods, hangers, levers, safety chains or hooks are lost or broken.
15. When steel brake beams are bent more than one inch out of horizontal line either way.
16. When the black hand of air gauge is at 70 lbs., and the brake valve handle in full release position, the red hand shows a difference of 5 lbs. or more.
17. When governor stops the pump 3 lbs. either above or below 70 lbs.
18. When governor requires a reduction of more than 5 lbs. before admitting steam to pump.
19. When there is not a plug cock in brake pipe to cut out engineer's valve, when more than one engine is used.
20. When there is no drain cock in main or auxiliary reservoirs.
21. When a pipe and cock are not provided from tender cylinder to foot board of engine for releasing tender brake.
22. When there is no oil cup on those driver-brake cylinders placed next to the firebox.
23. When the rear end of tender is not supplied with a hose having a good gasket; also a dummy coupling.
24. When the forward end of engine is not supplied with same equipment as rear of tender.
25. When a spare hose is not carried, and in good condition.
26. When safety-valves are used on the main reservoir, or any part of the piping.

A. B. UNDERHILL,
SPRINGFIELD, March 1, 1892. Supt. Motive Power.

Hard Steel Rails Abroad.

The present status abroad of the Thomas process, with special reference to steel rail manufacture, forms the subject of a paper recently read by Johann Rybar before the Austrian Engineers' and Architects' Society.

The fact prominently brought out in the paper is that with the more recent metallurgical developments the Thomas process is now capable of turning out steels eminently suitable for rails, and of various and greater degrees of hardness than was possible a few years ago. In support of this is given a series of elaborate, tabulated statements of results of tests of Thomas steel rails made for different Austrian railroads within the past two years, all of them showing that the material came well within the prescribed limits of the buyers. In the actual service of the rails after their delivery there have, moreover, yet been no unfavorable developments.

The more particularly interesting matter in Mr. Rybar's paper, however, is that involving the consideration of the subject of hard and soft steel for rails, though it is brief. Mr. Rybar maintains that the incontrovertible proof now available of the possibility of turning out Thomas steel of any desired degree of hardness will speedily lead to a definite conclusion in the question as to whether hard or soft steel is preferable and that this conclusion will be in favor of the hard steel. The advocates of soft steel, he says, have hitherto been found principally in Germany, where the Thomas process has been specially developed with the view to utilizing the large native deposits of high-phosphorus iron ores. The impossibility, however, until lately, of producing Thomas steel of any definite degree of hardness, and the heavy pecuniary interests involved in the industry made it quite natural that the German manufacturers should strongly resist whatever tendency there was toward the adoption of harder steel for rails. The extent of the influence of this opposition can be better appreciated when it is borne in mind that in 1889 there were in Germany, on the authority of Dr. Wedding, only two works, that at Essen and another at Osnabrück, which worked the acid process, all the others having gone over to the basic process. At a meeting of German iron and steel manufacturers, held in 1889, to discuss the requirements of and formulate specifications for steel for rails, the decision reached was that the maximum of tensile strength should be 45 kilog. per sq. mm. (about 62,000 lbs. per sq. in.), and that steel rails having a tensile strength of 50 kilog. per sq. mm. (about 69,000 lbs. per sq. in.) were less reliable for service. Fixing the maximum limit at less than 62,000 lbs. was prevented only by the very decided remonstrances of the representatives of the Essen and Osnabrück works. As to the asserted inferiority of the steel of the higher tensile strength, the Osnabrück representative gave prominence to the statement that those rails which had, up to that time, best acquitted themselves in service, had a tensile strength doubtless much beyond the 62,000 lb. limit, and that, in considering the matter of a safe rail, there was just as much attention to be given to distortion and abnormal wear as to breakage.

In order to show to what extent German roads used rails exceeding the 62,000 lbs. tensile strength with its corresponding degree of hardness, Mr. Rybar had prepared a table giving the results of tests of rails delivered since 1880. The figures come from official sources and show that from 60 to 70 per cent of the rails delivered and used had a tensile strength exceeding 55 kilogs. per sq. mm. (about 75,600 lbs. per sq. in.), and it appears that none of these rails warranted or gave rise to any suspicion of danger.

Mr. Rybar gives also a table showing the number of

INSPECTION LOCOMOTIVE FOR THE ADIRONDACK & ST. LAWRENCE RAILROAD.

Built by the SCHENECTADY LOCOMOTIVE WORKS, *Schenectady, N. Y.*

fractures of steel rails in service on a number of German and Austrian lines in the interval from 1880 to 1889, but this, he points out, scarcely warrants drawing any conclusions owing to the lack of specific information as to the conditions under which fracture occurred. In the severe winter of 1890-91 hard rails were used for the first time on the Northwestern Railroad of Austria and the experience with them, while of course of comparatively short duration, has proved highly satisfactory, not a single case of fracture having occurred.

Judging from the experiences thus far gathered Mr. Rybar concludes that higher tensile strengths, and accordingly greater degrees of hardness in steel rails than those of past years ought not to give rise to apprehensions as to safety. Taking the tensile strengths specified for steel rails in different countries, he finds them to be as given below, France calling for the hardest rails:

	Kilog. per sq. mm.	Lbs. per sq. in.
France: for double head rails	70-85	96,250-117,000
" for wide flange rails	55-75	75,600-103,000
Spain: for wide flange rails	60-65	82,500- 89,375
England: for double head rails	50-65	69,000- 89,375
Belgium: for wide flange rails	60-70	82,500- 96,250
Holland: " " " "	52-65	71,500- 89,375
Sweden: " " " "	55-60	75,600- 82,500
Norway: " " " "	65	89,375
Switzerland: " " " "	55-65	75,600- 89,375
Roumania: " " " "	55	75,600
Vienna-Warsaw, Warsaw-Bromberg and Finnic railroads	60	82,500
Argentine roads	55	75,600
German and Austro-Hungarian roads	50	69,000

Notwithstanding the above specified 69,000 lbs. for German rails, the actual figure as already mentioned is above the 75,600-lb. limit. The table shows that not only railroads in mild climates, but also those exposed to severe winters, call for high-tensile strength rails—a circumstance pointing, Mr. Rybar thinks, to the proper course to be followed, viz., the general adoption of harder steels for rails.

The Blizzard in the Northwest.

Last week there raged throughout the Northwest a blizzard, which was probably more severe in the vicinity of Duluth, Minn., than in any other section of the country. All of the Northwestern roads were bothered, but fully as much on account of the wind, which got up to 70 miles an hour, as by the snow. The storm was entirely unexpected, and the United States weather bureau officials were greatly surprised that so serious a storm should come with so slight warning. The fall in temperature was, on an average, fully 50 degrees. The storm began on Tuesday in the far Northwest, and in 24 hours had traveled 1,200 miles.

The lines south and east of St. Paul did not suffer much, the most serious delays being north and west of that point. Trains between St. Paul and Chicago were delayed only about two hours—some of them only a few minutes. The worst delays were in and around Duluth. One train on the St. Paul & Duluth was detained between West Duluth and Duluth for 16 hours. Another train on the same road was over an hour getting out of the Duluth Union depot. The Chicago, St. Paul, Minneapolis & Omaha met with nearly as much trouble at Duluth, and each of the roads canceled the southbound night trains on Wednesday. Both of these roads found it necessary to use three engines to take trains out of Duluth and West Superior. Their tracks were cleared later with push plows.

The Northern Pacific ran a push plow as the first section of all main line trains, and was in this way enabled to keep the line open. Between Winnipeg Junction and Jamestown the wires were down the greater part of the day on Wednesday, and this added to the difficulty in operating trains. The Jamestown & Northern branch was so badly blocked that it was necessary to open it with a rotary. One train was held at Fargo and another at Winnipeg Junction on account of the high wind, which blew an elevator from its foundation on to the side track. The Great Northern was also tied up, trains on Wednesday being delayed about five hours, and the train from Winnipeg south was held over night at Neche. The line from Minneapolis to Willmar was opened with a push plow on Thursday.

At Winnipeg all trains on the Canadian Pacific branch lines on Wednesday night were canceled and the only train sent out was the one south to St Paul. The Pembina Mountain branch line was so badly blocked that a rotary was required to open it.

The other lines in the Northwest were delayed more or less, but all of them state that had it not been for the heavy wind the delays would not have been worth mentioning. As it was, it was impossible to see the length of a car ahead of the engine and running under such conditions was hazardous. Had the storm begun in the day time instead of at night the loss of life on the prairies would have been appalling.

Old railroad men say that they in 20 years never experienced so severe a storm of wind and so much trouble when there was so little snow.

Power Bending Rolls.

The illustration herewith shows a new plate bending machine designed and built by the Niles Tool Works, the well known manufacturers of heavy machine tools at Hamilton, O.

This machine has found particular favor among railroad men and boilermanufacturers. It has capacity for bending iron or steel plates up to ¾ inch in thickness, and is usually built to take in such plates from 10 to 122 in. wide.

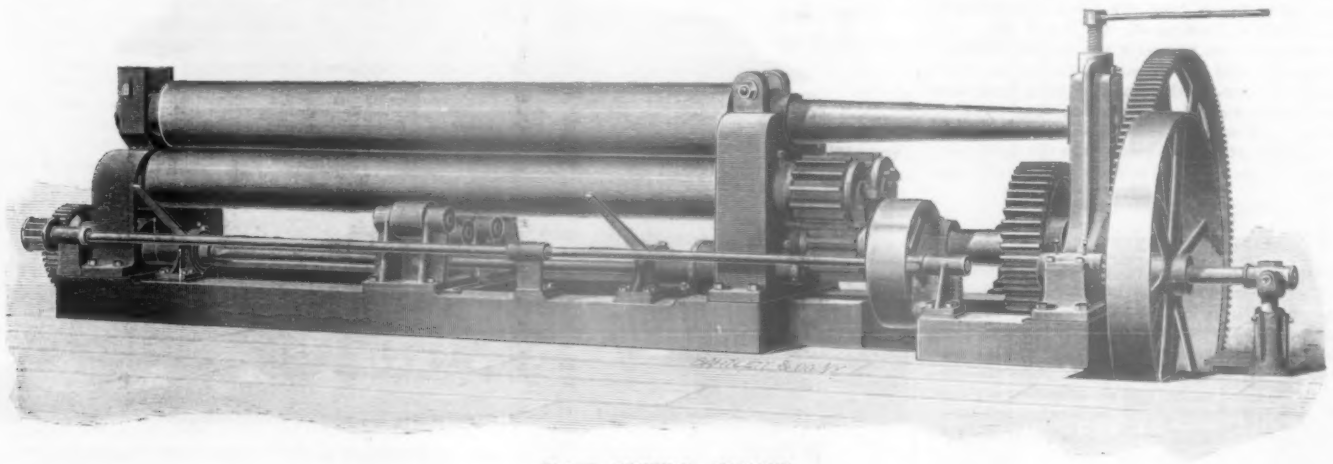


PLATE BENDING MACHINE.

By the NILES TOOL WORKS, *Hamilton, Ohio.*

The rolls are solid, wrought iron forgings, arranged in pyramid form, the lower rolls being geared together. The upper or bending roll is operated by friction of the plate in passing through. It is adjustable by power to suit the thickness of plate and the radius to which it is to be bent. It has a movable bearing at one end and projects beyond the housing at the other in the form of a taper arm. Provision is made for depressing the extreme end of this arm by means of the screw shown in the illustration, thus raising the opposite end and permitting the removal of a ring or fine. This feature will be found of especial convenience and advantage in boiler and other shops where plates are to be bent to complete circles.

The lower rolls receive additional stiffness from a gang of supporting rollers placed on the sole-plate midway between the housings. A heavy cast iron sole plate ties the machine firmly together. The machine is very powerfully geared and all parts are made exceptionally stiff and substantial.

Suitable levers and clutches are conveniently placed for the quick and easy control of all operations of the machine.

The cut represents this machine as arranged for belt driving power, although the design comprehends the substitution of a pair of reversing engines to drive the machine, and it is so made when desired. When the engines are used the sole plate is extended to form a base to receive them, and the whole then becomes one solid rigid tool.

Freight Car Trucks.

The above subject was discussed informally at the meeting of the New England Railroad Club, March 9, the expected paper on the subject having failed to appear. Following is the substance of the discussion.

Mr. ADAMS: I find that most men build such a truck as they want, and there is considerable difference in their views as to what is best, I presume this will continue as long as railroads exist. There is a great variety now in use. The diamond truck is perhaps more generally used than any other, and it perhaps costs less to build. Mr. Brady has a new truck, and I would like to hear what he claims in regard to it.

Mr. JAMES B. BRADY (FOX Solid Pressed Steel Co.): The truck referred to, and which is now running on a good many roads, is a pressed steel truck. It is light and in one piece. We have now run it two years and seven months on two roads. Some cars are two and a half tons lighter by reason of its use. It carries 120 tons. We give a positive guaranty that it will not cost five cents for repairs in five years. We think it will last 15 years, but we guarantee it for five. Some people are afraid that the riveting will not hold, but during the time it has been in use it has made no trouble in that way. The Pennsylvania and New York Central report that they find the riveting is done well, and has not become loose. It is modeled on the Boston & Albany truck. The whole truck, except the wheels and axles, is carried on springs. We have it running under five large passenger engines on the Pennsylvania road, traveling 300 miles a day. An ordinary set of trucks under these engines would run only three months, and they had to be continually looked after. An engineer on the Union Pacific, who is using this truck, says that on the first two or three trips he looked at the truck after every trip, but since then he had no occasion to examine it; other trucks had to be looked at every trip.

Mr. ADAMS: The New York Central had many thousand riveted trucks, and they were got up by the best engineers, but they ran four or five years, and have been abandoned, because nothing could be done with them when they got disabled; it was too much expense to try to keep them in order. We have a riveted bridge across the Connecticut River, which was put up some years ago, and there were eight or ten men at work on it all of one season, riveting it over. Consequently I associated the idea of this truck, it being riveted, with this bridge, but I may be mistaken. I approve of the principle of the Fox truck. I believe the correct principle is to have an iron frame truck that rests on springs; it will last longer built in that way than if it rests upon the journal box as the diamond truck does. Of course it will cost more than the diamond truck, but it is a great deal better. We have trucks that have been in use 30 years, and to all appearance they are as good to-day as the day they were put up. There is no difficulty in building our style of truck to carry any load. We have them under 60,000-lb. cars, and they will stand almost any amount of service. We have had 75,000 lbs. on them many times without any apparent weakness being manifested. We put Mr. Brady's trucks under two 60,000-lb. cars, but they were sent off into the coal region, and I have not seen them since. I am fearful about the riveting, though I suppose work of that character is done better than it was years ago. If the riveting never fails, there is no chance for the truck to deteriorate in any way, though the parts round the oil box may wear some.

Mr. BRADY: We do our riveting by hydraulic power. The New York Central trucks that Mr. Adams referred to were made by contract and by hand. Their metal was thick, and our metal is thin.

Mr. ADAMS: Those New York Central trucks were of the diamond pattern, and rested on the journals without springs. There was no elasticity, and so the rivets were badly affected.

Mr. COUGHLAN: When ordinary men with little experience can weld electrically—which will be soon—the troubles of riveting will have vanished, and then there is nothing in this truck that cannot be made completely solid by that process. That being the case the objection which has been mentioned as to riveting will be eliminated. It is too early to form an opinion on this truck. The urine from cattle which are conveyed in cars will soon eat away any substance. The trucks under an ice car will be affected by corrosion. We all know that if steel rails are laid by they will wear out more in two years than if kept in actual service.

Mr. ADAMS: What is the price of this truck?

Mr. BRADY: $110 for a car, without the springs and boxes, and six dollars extra for centre plates. I suppose we should call it a frame, not a complete truck. The Old Colony road is running it now. Mr. Lauder has given it much attention and is running some on express trains.

Mr. ADAMS: I don't know that there is any kind of paint that would obviate corrosion entirely, and I should be afraid there would be some parts where the water would get in and where the paint wouldn't get in.

Mr. BRADY: I have spoken to some steel men on the subject of corrosion, and they simply laughed and said there would be no such thing. We will guarantee our truck against corrosion anyway.

Mr. ADAMS: I have seen a good many of our iron trucks rusted very badly, so much so that large flakes would come off of the iron. Hundreds of iron cars built in New York were corroded so badly around the sills that you could get your hand in anywhere. There was a time on the West Shore road when the sides of the steps in the passenger cars were made of iron, and they rusted so badly and fell to pieces so quickly that they had to be abandoned.

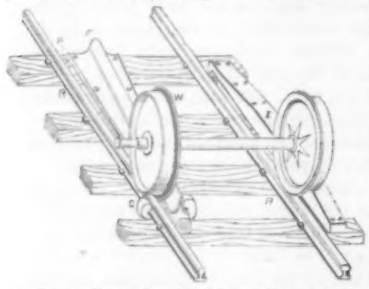
Mr. BRADY: They were made of iron, and not steel; and the trouble in the other cars which Mr. Adams spoke of was occasioned by jamming, and there were very few of the cars that had those holes round the side.

Mr. MARDEN: We ought to have a uniform truck. I believe in a truck where you can hang the brake on the outside. We used the Jewett truck for a time, and it

had one good feature—it did not depend on the bolt for strength, and so no nuts got off, and it did not break down. I wish we might have experiments made to such an extent that we could feel convinced that some one particular truck was the best.

Rerailing Frog.

The illustration shows a rerailing frog handled by Messrs. Fairbanks, Morse & Co., Chicago. This wrecking frog has been greatly strengthened and is reported as effective in replacing on the track in a few minutes the heaviest locomotives as easily as the lightest without injury to trucks. As will be observed, it is extremely simple in construction, and its application can be easily understood by ordinary train hands. One man can carry it and put it in position. If left behind after use it is not an obstruction to passing trains.



In practice the wheels of the locomotive or car are raised just high enough to clear the rail, requiring the minimum of power and saving the trucks against injury incidental to a drop of two or three inches. One great convenience is that it reaches the derailed wheels some distance from the rails.

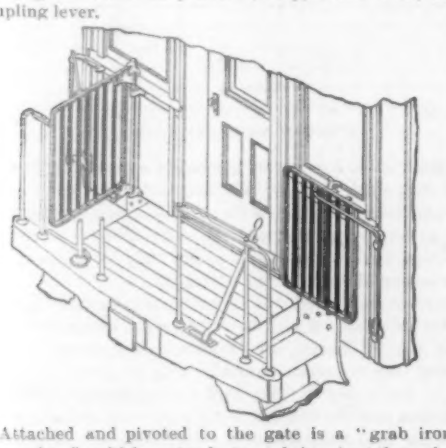
The frog is held by the clamp *C*, which passes under the rail; also by the teeth *P*, which bite into the tie. The flange of the wheel of the derailed locomotive or car comes on the frog between the central rib *F* and the rail, and as it is drawn forward, is at once gradually lifted and forced over so that the tread takes the rail.

The frog proper weighs 80 lbs., and is made of white oak, plated on the upper side with steel plate ⅝ in. thick, and on the under side with similar steel plates each 10 in. in length from the ends, and two narrow plates between, securely bolted through. The lifter weighs 55 lbs., and is of oak covered with a continuous band of the same thickness of material as the frog, and bolted.

Wood's Car Platform Gate.

In former issues we have described this gate, which is shown in the illustration.

As will be observed, a swinging post with arms at top and bottom, is attached to the end of the car by means of a pivoting piece at the bottom, and a collar above. The gate is hinged or pivoted to the post (top and bottom) at a fixed point on the gate, and to the outer point of the arms. By pivoting at these points the motion is secured which accomplishes the double purpose of permitting the gate when in use to be placed in position directly across the car platform, and when not in use to be swung back, occupying a space which is unavailable for other purposes, and without interference with any existing condition of platform, step, brake staff, or coupling lever.



Attached and pivoted to the gate is a "grab iron brace bar," which extends to and is pivoted to the outer corner of the car by means of pivoting pieces. This, when the gate is in use, securely holds it in position, serves as a hand rail and is an important factor in holding the gate in place when it is folded back. The fastening of the gate when opened or closed is secured by one double acting latch attached to top of the post as shown in cut. No fastenings are required on buffer beam end of gate or platform, thus permitting of an adjustment to all widths of openings.

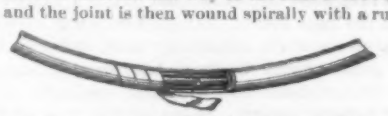
The gate closes to within 5½ in. of the platform and is parallel with the face of the steps, and the swing of the gate is inward toward the car platform. This gate is made by the R. Bliss Mfg. Co., Pawtucket, R. I., and introduced by J. B. Goodwin, New York.

A Launch at Newport News.

"El Sud" built for the Southern Pacific line, to run between New York and Galveston was launched at the yard of the Newport News Shipbuilding and Dockyard Co. the 16th. The keel of "El Norte," a sister ship, was laid at once.

An Adjustable Rubber Gasket.

The Peerless Rubber Co., New York, has put upon the market a new style of gasket for steam boilers which is decidedly unique, and will prove both a convenience and a source of economy. It consists in a specially prepared rubber tube, having a hollow core of several layers of duck united by "friction," and supporting the pure rubber that constitutes the main bulk of the tube. By cutting the tube into a suitable length to fit around the man- or hand hole plate, and making a tight joint between the two ends, the gasket is complete, needing only to be flattened by the pressure from screwing up the plate to conform perfectly to its seat. The joint is made by means of a short soft-brass tube, supplied with the gaskets, which is inserted half-way in the ends of the rubber tube, and the joint is then wound spirally with a rubber

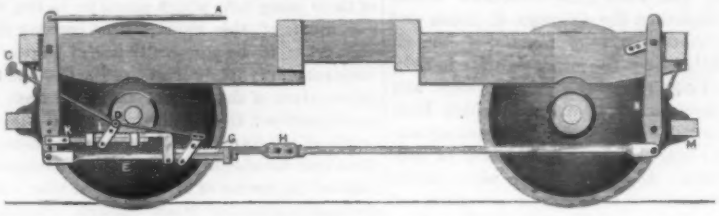


tape containing a raw vulcanizing compound which vulcanizes upon the gasket by the heat from the boiler, making it perfectly tight. The little brass tubes easily flatten under moderate pressure. By the use of these gaskets the necessity of carrying a large assortment of sizes in stock is avoided, and they may be filled quickly and with perfect accuracy to any size of opening. The rubber tube is made ⅜ in., ½ in., and ⅝ in. in diameter, and is put up in boxes of from 5 to 6 lbs., each box containing extra metal tubes and a roll of gummed tape for joints.

Brake Slack Adjuster.

Some time since we announced that the Mason Regulator Company, of Boston, had put on the market a brake slack adjuster, designed by Mr. E. G. Desoe, Air Brake Inspector, Boston & Albany. This device is described below:

The rod *A* connects directly from the cylinder with the lever *B*, pulling with it the brake beam *C*, and through the lever connection of rod *E*, and this in turn drawing rod *H*, which connects with the lever and sets beam *M* through the dead lever *N*. When there is any wear on



the shoe, the auxiliary rod *K* is pulled forward with the motion of the lever *B*, thereby catching up as many teeth of the ratchet *D* as are necessary to compensate the wear on the brake shoe. When the brake is released, the auxiliary rod *K* holds the two beams together, what has been taken up by wear and the lower rod *E*, is then held by ratchet *G*. The ratchet *D* simply takes up the wear and holds it, so that when the brake is released the rod *E* will shorten.

Cars and Engines for the Chicago Elevated Road.

The Chicago & South Side Rapid Transit Railroad Company, of Chicago, otherwise known as the "Alley" Elevated road, has now decided upon all of its equipment. The cars are to be like the latest Manhattan in general appearance, but will be painted a transparent olive green and decorated with gold. The platforms are to be two feet wider, and will permit two persons to pass abreast without crowding. The doors in the ends of the cars will be double. The interior finish is polished mahogany, with light ceilings. The seats will be arranged the same as on the Manhattan cars. The trucks are to be of iron and steel, with turned bolts and reamed holes, and all parts liable to rattle will be provided with rubber washers. The truck wheels are of the Vauclain type, furnished by the Baldwin Locomotive Works, and the trucks will be built by the Standard Steel Works. The Westinghouse automatic air brake will be used for the engines and trains, with improved devices for stopping the trains as quickly as possible. These brakes will be provided with the automatic and quick action features. The sound of the exhaust and the air pump will be muffled.

The locomotives are of the Vauclain type—four cylinder compounds, with 9 and 15 × 16 in. cylinders. They are to have wrought iron drivers, 42 in. in diameter, and will weigh 28 tons. There will not be any woodwork upon the engines except in the tool boxes in the cab. The boilers will have a capacity about double that of the Manhattan engines, and with the large grate it is expected they will burn a low grade of fuel; not bituminous, but perhaps anthracite slack. Every endeavor has been made to provide the very highest grade of equipment. No expense has been spared to do this. Mr. R. I. Sloan, Chief Engineer of the road, who was for many years Chief Engineer of the Manhattan elevated, has given much attention to all the details, and his long experience has enabled him to select many improvements for this new road, which is to be in operation not later than May 1. Some of the cars are already in the paint shop, and the locomotives are about half completed. The line of the road is now unbroken for the first four miles where the first turn is made to the east, and the contract has been let for the entire structure to Jackson Park to be completed on or before the first day of January, 1893.

From the outset, the management of this road has determined upon an average speed of 15 miles an hour over the road. The stations are closer together than the average in New York City, where the average speed over the line is less than this; hence, it has been necessary to provide more powerful engines and brakes. With a given time for stopping at stations it is, of course, evident that the velocity over the line will depend upon the ability of the locomotive to start the train quickly and the power of the brakes to stop in the shortest possible time. The Baldwin Locomotive Works have undertaken to accelerate the trains as quickly as is necessary, and the Westinghouse Air Brake Company has guaranteed to stop them in the required space without discomfort to the passengers.

Shop Notes—Toledo, St. Louis & Kansas City Ry.

The new shops of the Toledo, St. Louis & Kansas City road at Frankfort, Ind., have been recently completed, and nearly all the machinery is now in position. They are intended for general repair and car building work, and will give employment to about 300 men. The two main buildings are of brick built in rectangular shape, one being for renewals and repairs of locomotives, and the other for building and repairing cars. The locomotive building is 318 ft. long by 50 ft. wide, and the car building is 232 ft. long by 80 ft. wide. Between these buildings is a space of 80 ft. arranged with foundation walls, for two traversing tables, to transfer the equipment and material to different points as required.

Beginning at the south end of the east building, the engine and boiler room occupies 25 ft. × 50 ft. of the building. The engine is a Watertown automatic cut-off, with cylinder 18 in. × 28 in., and the boiler is a return tubular one, of 66 in. diameter and 18 ft. long, with 54 four-inch tubes. Adjoining this room is the boiler-making and blacksmith shop, 120 ft. long by 50 ft. wide. In this there is a powerful double shear and punch with 30-in. throats and a large plate bending machine, the rollers of which are 8 ft. long, to be driven direct from the line shafting. Also a 2,000-lb. steam hammer and 12 smiths' hearths, and the usual formers and hand work, working tools of different kinds, suitable for general railroad service.

The machine shop comes next, and is 100 × 50 ft. wide. It contains the following machines: One 54 × 54 in. planer with 29 ft. frame, one 26 × 26 in. × 10 ft. planer, one 16-in. shaper, one 16-in. slotter, one 6 ft. arm radial driller, one 32-in. back gear driller, two 24-in. back gear drillers, one double and one single bolt cutter, one four-spindle nut tapper, one 36 in. × 14 ft. engine lathe, one 22 in. × 10 ft. lathe, one turret 18 in. × 6 ft. lathe, two 14 in. × 6 ft. bolt lathes, one 79-in. wheel turning lathe, one single axle lathe, fitters, vises and benches, and the usual hand working tools and appliances for incidental repairs. Adjoining is the erecting shop, 73 ft. long by 50 ft. Four pits and the usual benches are in working order.

The opposite building consists of a wood-working machine shop 60 ft. × 80 ft., and adjoining is the car building and repair shop, 172 ft. × 80 ft. In this part are eight tracks, each of which will hold two freight cars in course of repairs. The tools placed in the wood-working machine are as follows: One 6 timber planer with eight feed rolls, double universal wood worker, bracket cut-off saw, vertical cut-off saw, cross gaining and mortising machine with 14-ft. table, 36-in. rip saw bench, one combined mortising and boring machine band saw, one pattern making lathe, metal drilling machine, automatic knife grinder and dresser, grindstone box and one steam glue heater, hydrostatic wheel press car wheel borer and the usual benches and hand working tools for incidental work that may be required for other departments.

In close proximity to the main buildings are the engine roundhouse with 12 stalls, the stores building, and the general offices for the operating departments. All the buildings have been conveniently arranged and furnished liberally with windows, so that throughout no better lighted shops could be desired.

Compound Locomotive Patents.

Mr. George P. Whittlesey, 928 F Street N. W., Washington, D. C., has prepared a list of United States and English compound locomotive patents, issued prior to Jan. 1, 1892. He will furnish sets of these patents for the following prices: United States, 43 patents, $7; Great Britain, 56 patents, $20. Each set comprises the drawings and specifications of every patent, and a complete index. A copy of either index will be sent for 50 cents.

RAILROAD GAZETTE

ESTABLISHED IN APRIL, 1856.
Published Every Friday.
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EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in his journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

The "Ticket-receiver" is, it will be remembered, an important officer in the system for making up prompt reports of ticket and cash fare collections which has been lately adopted on the Chicago & Alton and which was described the *Railroad Gazette* of Jan. 22. This officer virtually brings the auditor's office in close contact with every conductor on a large system and thus removes those causes of friction which have grown up with the enlargement of the accounting machinery which has followed the consolidation of railroads in recent years. As the ticket-receiver's office is not very widely known, we have asked an officer of the Pennsylvania road, where the plan originated, to write a somewhat detailed sketch of it, and this sketch will be found in another column. The reader will have to bear in mind that this article was written by an accounting officer, who, very naturally, does not "go behind the returns," and who, therefore, gives only a couple of lines to the statement that an advantage of the system under consideration is the facility with which the earnings of any particular train can at any time be reported within *one or two days;* but remembering what we have said heretofore on this subject and from what has been learned by actual experience on most of the roads of the country the interested reader will note that this fact is one of the most important in the whole statement. The temptation to steal cash fares and to resell tickets is so strong under our present system of conducting this branch of the business that every road is bound in fairness to itself and to its men to compare ticket sales and collections very promptly, and to do it systematically. It is not necessary to assume that every conductor is a thief; if one in twenty is unfaithful the most rigid checks are necessary, and probably the conductors themselves, if they spoke frankly, would admit the danger to be at least as bad as that. A railroad officer who has made considerable careful inquiry, estimates that the losses of many roads through unfaithful conductors equal $10,000 a year for each 100 miles of road. Nevertheless, as we have said before, it is the duty of every company to keep a check upon conductors just as much as upon ticket sellers and freight cashiers, whether stealing is suspected or not.

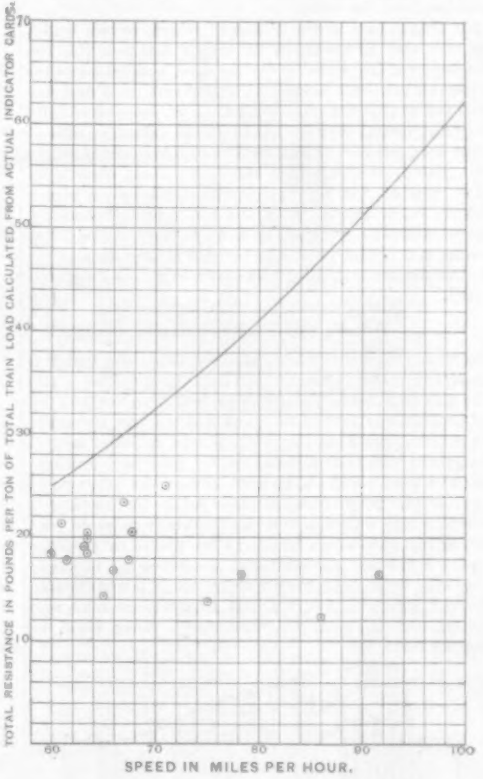
For the investigation of the history of prices since 1840, which a sub-committee of the Senate Finance Committee has undertaken, Professor Adams, the Statistician of the Interstate Commerce Commission, is to make an inquiry into the extremely interesting question of the changes in transportation rates, for which purpose he has addressed to railroad managers a circular letter describing the general plan which it is proposed to follow, and asking for suggestions and for information as to records of rates. This is a work which it is very desirable to have done, and as the *Railroad Gazette* has reason to know, very difficult to do. Many years ago, when we attempted to give a history of trunk line rates, it was only after weeks of inquiry that we could find any office which had preserved a record of Chicago-New York rates for a few years even; but the material then collected has been the basis of records since published in several official documents, and seems likely to be preserved. It is desirable, of course, to have other records than these, and especially to present with the trunk line through rates, which now probably govern more than half the traffic of the country an account of the manner in which they have been adjusted from time to time between the various places to which they apply, and the dates at which they have been extended to new fields. But perhaps even more important than this, is a history of rates on the lines west of Chicago, where not so very long ago all the traffic was strictly local, and now for years a great through business has been developed, and all rates modified from a system applicable to a frontier farming country, to one suitable to a highly developed industrial community, whose existence and growth were made possible only by intelligent rate-making. In other sections a similar study would have great value, but these are of transcendent importance because they cover not only the greatest bulk of traffic, but a traffic which could not have existed without a system of low through rates. The agriculture of the cotton growing states was never to such an extent dependent upon the carriers, because their product is valuable in proportion to its bulk, and production and export are possible in most parts of the cotton states, except perhaps northern Texas, without railroads. The industrial development of the South during the last 15 years, however, has been almost wholly dependent on cheap transportation, which it is evidently getting when iron made in Central Alabama is able to compete with Pennsylvania iron in the Philadelphia market. It is to be desired, therefore, that those railroad companies which possess records will freely afford all the information possible for this history. Once put on record, there will be no danger of their being lost, which seems to be the fate of most documents of this kind in this country shortly after they cease to be practically useful in the conduct of business. Very likely it will not be possible to get much information of the earliest rates, but that does not so much matter; they applied to but a fraction of the traffic of the country. But it is very much to be desired that we should have a tolerably complete general view of the course of rates since the war. A history of through rates alone is not enough, though to an immense part of the country they have now become of transcendent importance. Their course gives an unduly favorable view of the progress made in cheapening transportation.

One-Hundred Miles an Hour.

In the recent *Scribner* articles on "Speed in Locomotives" Mr. Forney, all his life a specialist in locomotive engineering, says: "These calculations therefore indicate that at a speed of 100 miles an hour on a level track an ordinary locomotive would do little more than pull itself and its tender and maintain the speed for any considerable time;" and, further, "it may therefore be inferred that there is not much probability of attaining regular and continuous speeds of 100 miles an hour with our present locomotives." Mr. Ely, General Superintendent of Motive Power of the Pennsylvania Railroad, sitting at the very fountain head of railroad mechanics, says "with these limitations the speed of locomotives with passenger trains will not fall far short of 100 miles an hour, by which is meant a sustained speed at that rate;" and, further, "it is fair to rest the burden upon the transportation shoulders and predict that with it and it alone lies the practical limit of the speeds of railroad trains drawn by steam locomotives." At first sight there seems to be a radical disagreement between these eminent doctors, but, giving due weight to the qualifications they make, they perhaps are not so far apart. Mr. Forney is considering what he calls the "ordinary" locomotive, with cylinders about 18 × 24 in. and 6-ft. drivers, weighing, with its tender, about 90 tons. He thinks that with better boilers, or fuel, or both, or locomotives designed so as to use less steam in doing the same work, or with all these three features combined, some of us may live to see trains hauled at 100 miles an hour. Mr. Ely too imposes certain limitations, viz., that steam must be used to best advantage relatively to the proportions of the locomotive and to its type, and it is evidently only when a better type is evolved that he expects to run continuously at 100 miles an hour.

But so far as the capacity of the modern locomotive goes the possibility of 100 miles an hour may be nearer than these eminent authorities suppose. The difficulties in the way may be exaggerated by two sets of errors. Train resistance at high speed may be overestimated, and the steaming capacity of existing locomotives may be underestimated. We are inclined to think that Mr. Forney makes both of these mistakes and we venture a few suggestions toward correcting these mistakes, using instead of the "ordinary" engine the most powerful express locomotives, and instead of the usual assumed resistance of railroad trains some definite information such as has been given in the *Railroad Gazette* before this, as, for instance, in the issue of March 28, 1890, where are given some resistances at speeds of 75 and 86 miles an hour on the Northeastern of England. We shall also compare some data obtained from experiments on the Central of New Jersey, the Philadelphia & Reading and Pennsylvania railroads, which will, perhaps, be more applicable.

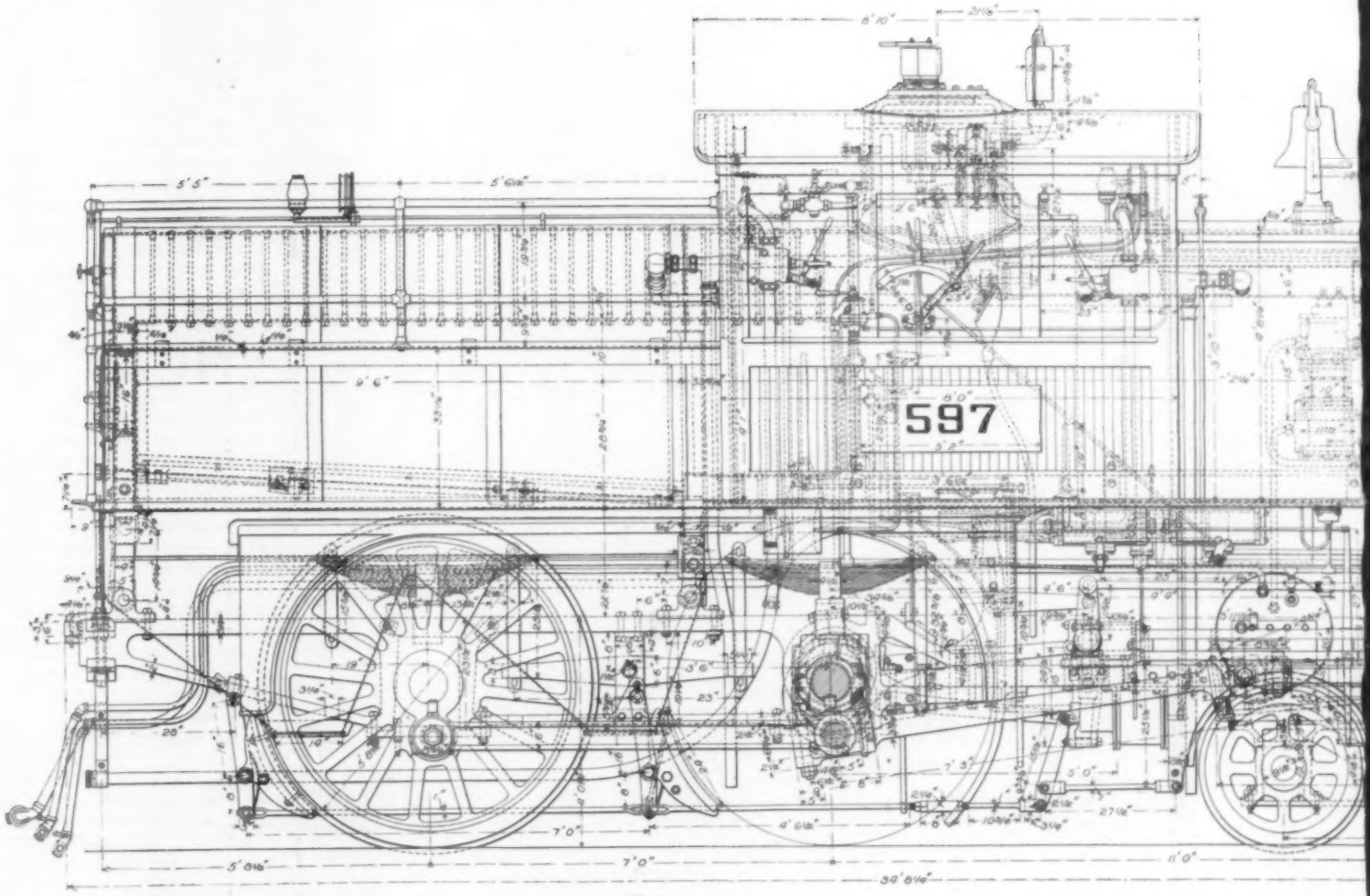
Instead of an eight-wheel locomotive with 24 sq. ft. of grate area why not take an express locomotive having 33 to 76 sq. ft. of grate and more heating surface and greater adhesion? The limit of locomotive power is held to be governed by the limit of grate area, and for the moment we shall consider only that feature. On the basis of coal-burning assumed by Mr. Forney, viz., 200 lbs. per sq. ft. of grate per hour, engines now running would burn from 6,600 to 15,200 lbs. of coal per hour, instead of 4,800, and evaporate from 39,600 to 91,000 lbs. of water per hour, instead of 28,000 lbs. Of course, no engine yet made could do this, as the basis

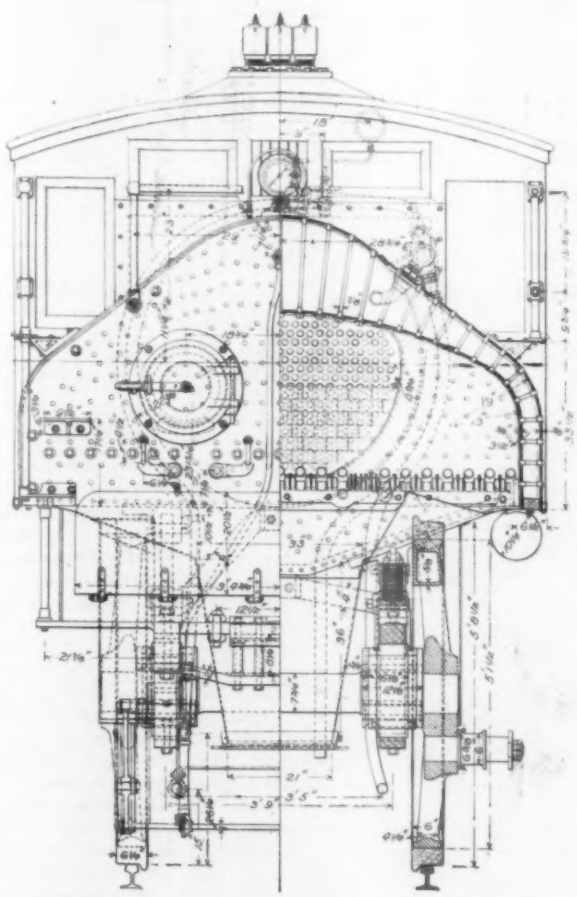


assumed is too high; but the larger engines could at least evaporate into steam 50 per cent. more water in the same time; and this, with other features, makes it easy to show that our high speed locomotives of the best type are in steaming capacity fully 50 per cent. more powerful than the one assumed.

We have mentioned the larger heating surface and greater adhesion of our most powerful locomotives. These give, of course, an advantage in economy, in starting heavy trains quickly and in overcoming grades; but unless the increased heating surface lies in the firebox or in the first few feet of tube area, and unless the train is to make frequent stops, these advantages have no especial value for strictly high speed work on level lines. That is what we are now considering, so we omit a discussion of these points.

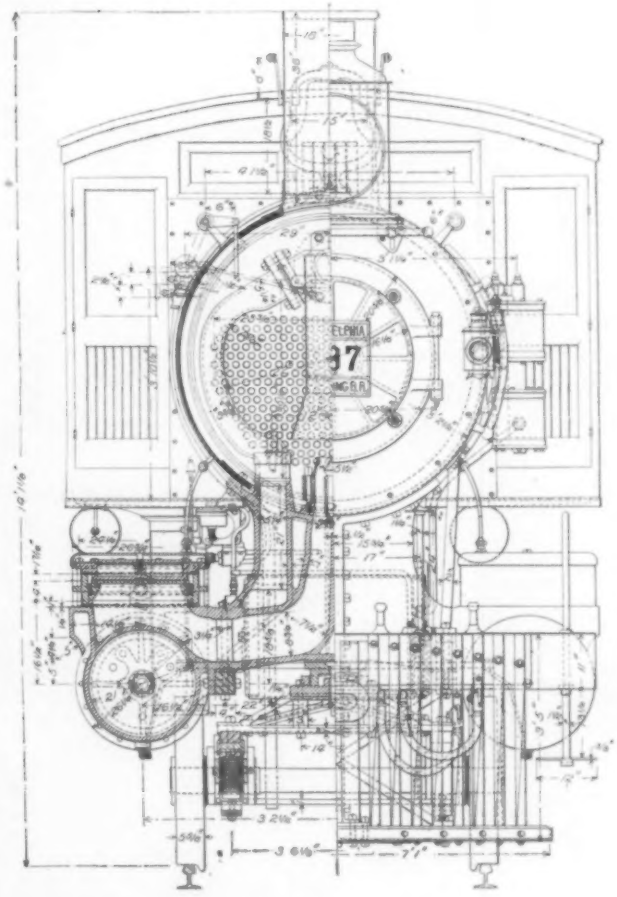
Before leaving this point we must, to prevent misunderstanding, say that 200 lbs. of coal cannot be burned per square foot of grate on any locomouve now running where the speed is 90 to 100 miles per hour. It may be drawn up the stack and wasted, but it will not be burned. Let us take, then, 150 lbs. for actual large engines and 200 lbs. for the "ordinary" engine and compare results. The "ordinary" will burn 4,800 lbs., the most powerful 11,400 lbs. The difference is 6,600 lbs.; thus engines now running for express work can burn more than twice the fuel that would be burned on the "ordinary" engine even when the fuel for the latter is reckoned on a basis much too high. To further illustrate this, note the coal burned on the Central of New Jersey flyer, noted last week, page 189. The





Half Rear Elevation.

Half Section through Firebox and Rear Driver, looking forward.

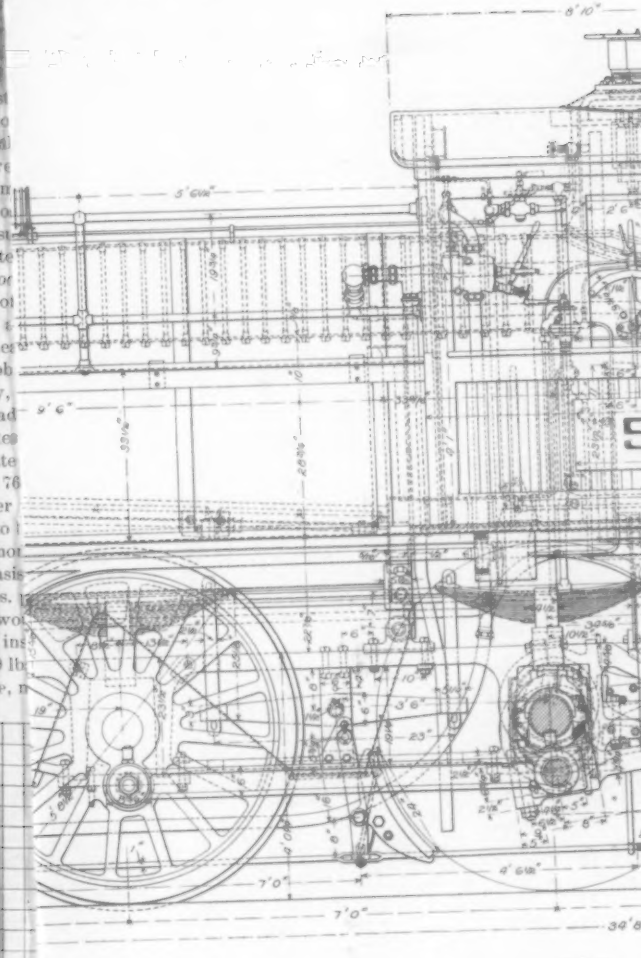


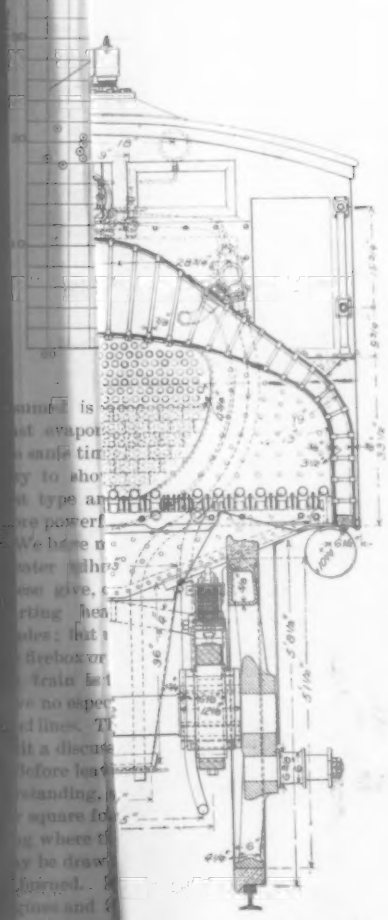
Half Section through Smokebox and Cylinder, looking backward.

Half Front Elevation.

PHILADELPHIA & READING EXPRESS LOCOMOTIVE, CLASS "D 44-11."

L. B. Paxson, *Supt. Motive Power and Rolling Equipment.*





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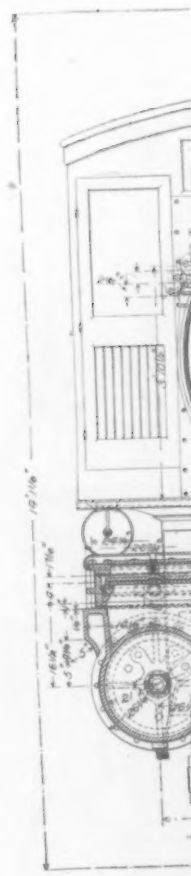

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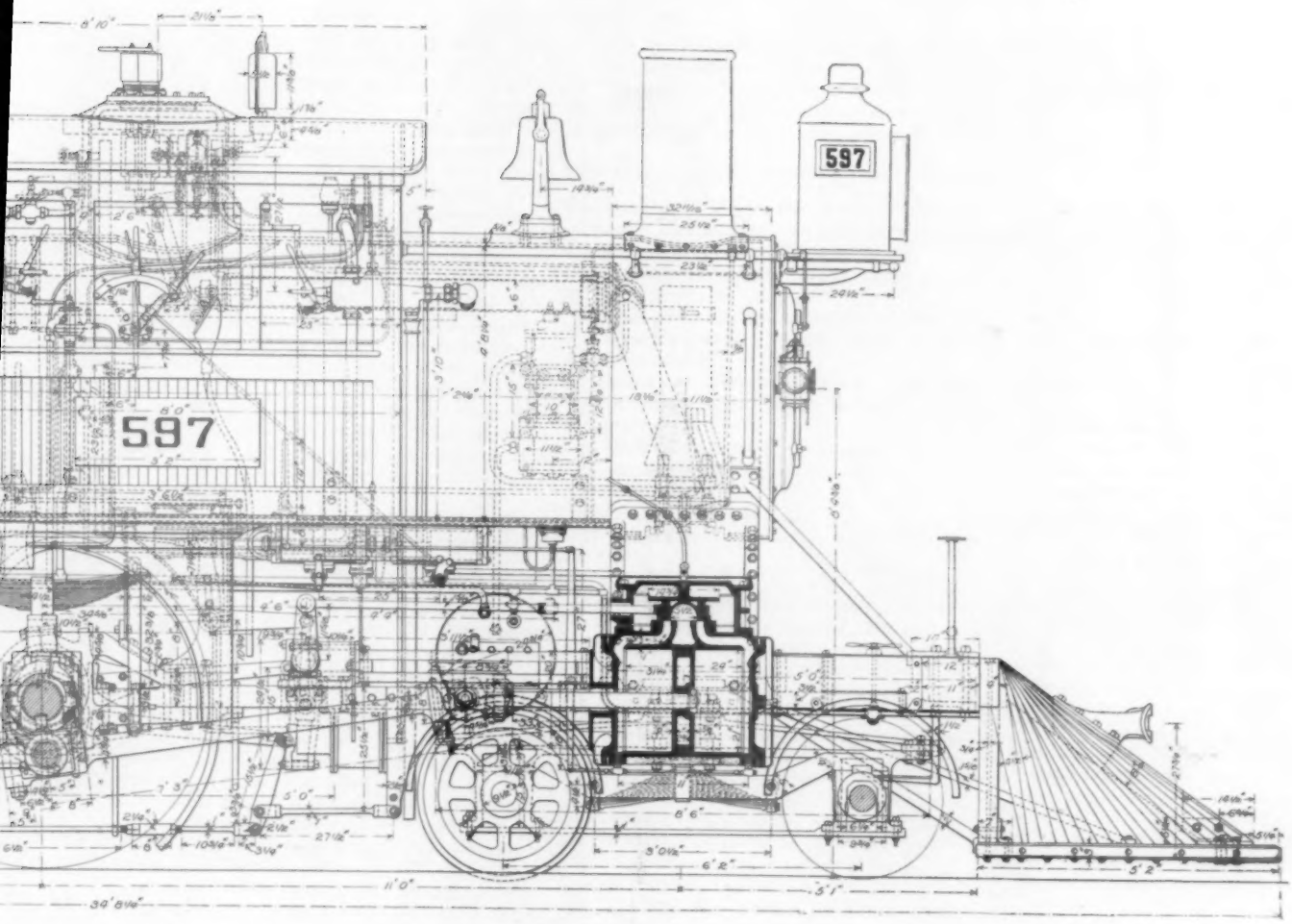

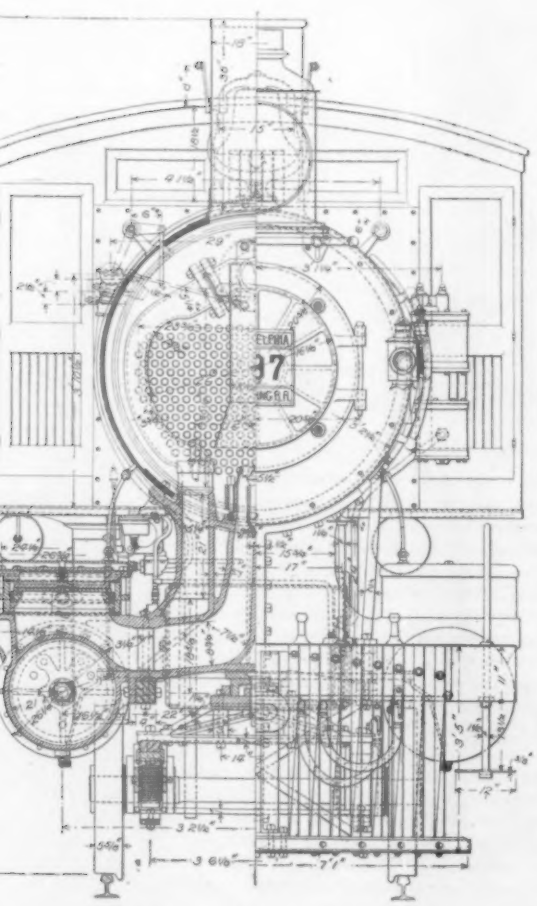

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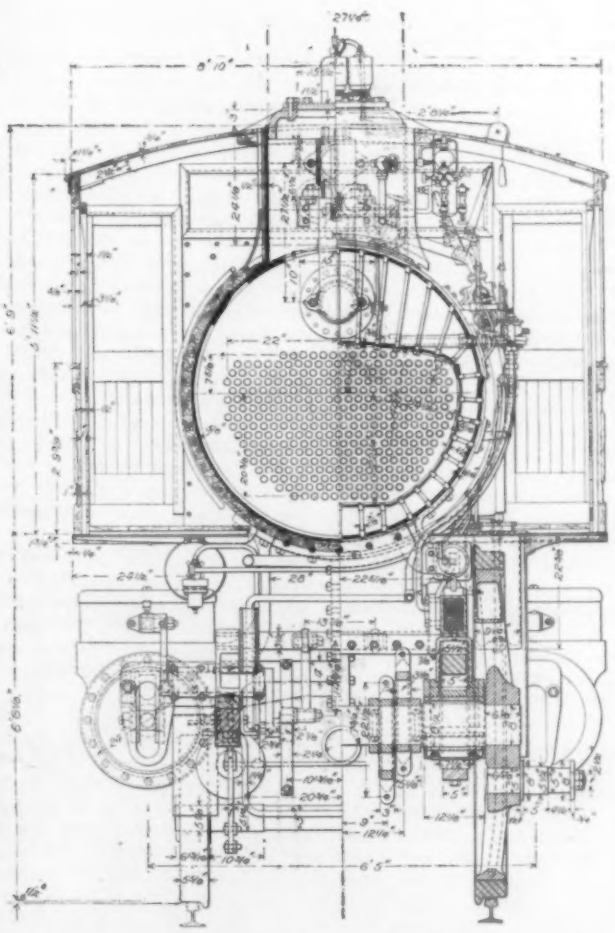
Half Front Elevation.



Half Section through Centre of Cab and Dome, looking forward.

Half Section through Combustion Chamber and Main Driver, looking forward.

LPHIA & READING EXPRESS LOCOMOTIVE, CLASS "D 44-11."

JAMES F. PRINCE, JR., *Mechanical Engineer.*

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average for high speed work, with a maximum speed of 91.7 miles per hour, is *but 49 lbs. per square foot of grate per hour*. The maximum we do not know, but as this engine was either running at high speed or accelerating the train during most of its running time, it is safe to conclude that the maximum was not much above 120 lbs. per sq. ft. of grate per hour, which would evaporate from 30,000 to 40,000 lbs. of water per hour. This, at least, seems reasonable, and what is more pertinent, accords with the steam used as determined from the indicator cards. In the card at 91.7 miles per hour the rate of steam used per hour, allowing 30 per cent. additional for that not accounted for by the indicator card, would be about 38,000 lbs. This is about one-third more than the "ordinary" engine was calculated to do, but is only about one-half of what existing powerful engines might be expected to evaporate when forced.

We shall now consider the assumed resistance of railroad trains which has led to the erroneous conclusion that " at a speed of 100 miles per hour on a level track an ordinary locomotive would do little more than pull itself and tender."

We have reproduced part of Mr. Forney's diagram given to illustrate the variation of train resistance, and on it we have plotted, as shown by the small circles, the actual total train resistances, including the locomotive, in pounds per ton of total load, based on actua indicator cards taken on the Central of New Jersey, Philadelphia & Reading and Pennsylvania railroads, and also on the Northeastern Railway, of England. Such data have been before engineers in this country many times before this, except that, perhaps, the speeds were somewhat lower. The account of the Northeastern Railway experiments was given in the *Railroad Gazette* March 28, 1890.

Before going further it will be necessary to agree that a locomotive indicator card represents the entire power generated in a locomotive; not only to overcome its own internal friction and back pressure, but to overcome all other resistances of the entire train, including head air resistance, rolling and journal friction, flange friction, resistance of grade, etc. Concurring on this basis, it is a simple matter of calculation to determine what is the power used to overcome the entire resistance of the train. This we have done in the following table, and the results are plotted on the diagram.

Year.	Road.	No. of cars.	Weight of train, tons.	Speed in miles per hour.	Mean effective pressure in cylinder.	Traction of engine calculated from indicator card, less 25 for internal friction.	Pulling force exerted by engine in lbs. per ton of total train.
1889..	Phila. & Reading	7	242.5	61	39.6	5,158	21.3
..	..	7	242.5	63.5	36.8	4,804	19.8
..	..	7	242.5	63.5	34.2	4,464	18.4
..	..	7	242.5	67½	33.2	4,322	17.8
..	..	7	242.5	60	34.1	4,449	18.35
..	..	7	242.5	66	31.3	4,082	16.84
..	..	7	242.5	67	43.5	5,668	23.38
..	..	7	242.5	63.5	33.0	4,900	20 46
..	..	7	242.5	71	44.7	6,950	24.95
1890..	Pa. R. R.		221.2	65	28.5	3,167	14.32
..	N. E. Ry.		247.5	75	....	....	13.78
..	..		347.5	86	....	....	12.34
1892..	C. of N. J.	4	213	61.5	40 & 13.8	3,800	17.8
..	..	4	213	63.2	41.3 & 15.0	4,030	19.0
..	..	4	213	67.9	43.8 & 16.3	4,352	20.4
..	..	4	213	78.3	37.5 & 12.5	3,505	16.4
..	..	4	213	91.7	37.5 & 12.0	3,500	16.2

It may be said that these indicator cards were taken when the engine was slackening from a higher speed to a lower one and that the energy already stored in the train was being utilized to assist in its propulsion at the lower speed, or that the grade was sufficient to reduce the resistance from that assumed and shown by the curve on the diagram to that estimated from the cards. But those cards were doubtless selected to show the maximum power, at high speed, of the locomotives from which they were taken, and if there was greater power exerted at any other time the other cards would have shown it. It is hard to believe that more power was exerted at a time just preceding that when the cards were taken, for the reason that the reverse and throttle levers which control the admission of the steam to the cylinders were in the same position, and the steam pressure remained practically constant for a considerable period. But why not as well assume that the train was being *accelerated* at the time these cards were taken, and that therefore they represent *more* power than that needed to overcome the resistance of the train to *uniform* movement? Further, a down grade of 1 per cent. would reduce the resistance but about 20 lbs. per ton, and hence if such a grade were assumed for the speeds given in the table the result would then be much less than is shown on the diagram, at 90 miles per hour.

It is clearly evident that the curve is largely in error and does not represent the varied conditions of train resistance at different velocities. For instance, it gives four times as much resistance at 86 miles per hour as was found on the Northeastern Railway. The curve of resistance given is based upon, as near as we can determine, $4 + \frac{V^2}{171}$. We have before called attention to this formula is not correct, even in form, to say nothing of the constants. It is not even approximate at high speeds. An approximate formula in its simplest form would. at least, have as many factors as the following, in which

R is the total resistance in pounds per ton.

F, the friction of the journals, wheels, flanges, etc., in pounds per ton.

f, the friction of the air on the side of the train.

p, the pressure per square foot of the air on the front of the train.

A, the area of the front of the train.

W, the weight of the train in tons.

L, its length.

G, the per cent. of grade.

Then the form of the formula would be as below;

$$R = F + f\,L + \frac{p\,A}{W} \pm 2000G.$$

The values of the factors are, of course, uncertain. For the purposes of approximation $f\,L$ may be omitted. A varies in effective area from 80 to 100 sq. ft. F is uncertain, and may vary from 6 to 12 lbs. per ton, according to the degree of lubrication, the size of the wheels, and the condition of the track, and the direction and force of the wind; p has a value yet undetermined, but from experiments made within a few years on the Forth Bridge (see *Railroad Gazette*, March 28, 1890), and some experiments with a revolving disc made later to determine the law of variation of resistance with relation to the speed, it may be safely assumed that the value of p is, say, 27 lbs. per sq. ft. for 60 miles per hour, and 40 to 60 lbs. for 100 miles per hour. Taking the average of these factors and omitting $f\,L$ the result on a level track for a speed of 90 miles an hour, and with a 230-ton train, is 28½; and this more reasonably accords with what is shown by the small circles on the diagram; it is very close to the result given by Gooch's formula quoted by Rankine: $6\left(1 + \frac{V-10}{20}\right)$. It is probable that the head air pressure as we have estimated it is too high.

It would be interesting to take the best modern engine and from its dimensions calculate its power at 100 miles an hour. It is safe to say that the results would show that there would be a large amount of steam power left to haul a considerable train after the speed of 100 miles an hour had been attained. We cannot say that some alteration would not have to be made in the valves for admitting steam to the cylinders at this speed; but such alterations could be made within the limits of our present knowledge of cause and effect. Within a fortnight the writer has ridden upon an engine hauling four cars at 90 miles per hour. There was no lack of steam and there was no evidence that the speed could not have been increased to 100 miles per hour with perfect ease were it not for the two factors mentioned by Mr. Ely, a clear track and a safe one. The line ahead could not be kept clear to prevent detention, and the curvature of the track was such as to require slackening so frequently that there was not enough length of comparatively straight and level track to give a sufficiently long period of acceleration to reach a speed of 100 miles an hour. To add 10 more miles to the speed already at tained would only require a small additional propelling power, or, perhaps, the same propelling power exerted over a longer period.

Another interesting comparison to show the error in the train resistance by the curve on the diagram is to apply the resistance which it shows, to the train which was hauled on the Jersey Central at 91.7 mile an hour. The resistance is given as about 52 pounds per ton. This would demand an expenditure of about 2,800 H. P. in the cylinders of the locomotive. It is safe to say that no such horse power could be exerted by the engine in question. The actual indicator cards taken at that speed showed but 930 H. P. A perfectly fair calculation would place the limit of that engine at about 1,500 H. P., perhaps a little more, but probably somewhat less.

Again, let us see what would be the horse power required to haul trains at the various speeds from 60 to 100 miles per hour, taking the resistance at that given by the assumed curve, with the weight of the train at 230 tons. These results appear in the following table, showing how the horse power of a locomotive boiler would have to be increased in order to haul trains at high speeds, based on the assumed resistances.

Speed, miles per hour.	Assumed resistance, pounds per ton.	Total horse power for 230-ton train.	Mean effective pressure in cylinders for total train.
60	25	920	52
70	29½	1,396	67
74	36	1,633	75
80	41	2,013	85
90	51	2,815	106
100	62.5	3,834	129

From this table it will be seen that at a speed of 90 miles an hour the horse power required would be 2,815. Such power does not accord with the indicator cards taken at about that speed and is not warranted by any extant facts about train resistance or locomotive power.

But although the resistance on level tangents, at high speeds, may have been overestimated and the steaming capacity of the modern locomotive may have been underestimated, there remain some immense practical difficulties in the way of hauling trains at 100 miles an hour. The horse power expended in overcoming even light grades at such a speed becomes enormous; and the piston speed at 100 miles an hour is something to make a mechanic shake his head.

Where Will the "Counselman Case" End?

We had occasion recently to call attention to the decision of the United States Supreme Court in the "Counselman Case," and to point out that the effect of that decision upon the Interstate Commerce Act was much more limited than seems to be generally supposed. It will be remembered that the Court held in that case that so much of the Revised Statutes of the United States, and so much of the Interstate Commerce Act as requires a witness to answer a question that tends to convict him of a crime or subject him to a penalty or forfeiture, is unconstitutional and void, notwithstanding the proviso that his testimony shall not be used against him in a criminal proceeding. The case was justly characterized as one of unusual importance as affecting rights of corporations and of individuals.

Quite all the States of the Union have statutes of import similar to these just declared unconstitutional, and it has heretofore been supposed that the proviso excluding testimony obtained under them was ample protection to the accused in any criminal proceeding against him. Thus, in the State of New York the Court may make an order, under the limitations of materiality and necessity, requiring a party to a suit to produce any book or document in his possession or under his control, for inspection, with a view to its use as evidence, under pain of divers penalties, including an adjudication as of contempt of court. And it is expressly provided that in proceedings relating to the judicial supervision, dissolution and annulment of corporations, no officer, agent, or stockholder of a corporation shall be excused from answering a question relating to the management of the corporation, on the ground that his answer may expose the corporation to a forfeiture of its corporate rights, or will tend to convict him of a criminal offense, or subject him to a penalty or forfeiture, but his testimony shall not be used as evidence against him in a criminal proceeding. The law establishing the Board of Railroad Commissioners for New York State, vests the Commissioners with the power to examine the books and papers of the railroad companies and to require their production, to examine witnesses and punish them for contempt for failure to produce such books and papers or to answer questions. And every railroad corporation is required, on request, to furnish the Board with information concerning rates of fare and freight, and the condition, management and operation of the road, together with copies of its contracts.

It is to be observed that these powers of effecting disclosures vested by the laws of New York in its courts and Board of Railroad Commissioners may at any time be exercised in cases which would reveal, under this search-light procedure, if employed without hindrance, the commission of criminal offenses more or less serious. It is at this juncture that the powerful prohibitory force of the Counselman decision may be felt. And it is just here, too, that interesting questions arise which can only be finally settled by the court of last resort.

In the case of an individual witness seeking to avoid criminating himself by furnishing evidence of an offense for which he may be personally responsible, we apprehend there is no reasonable doubt now, under the Counselman case, that he could forestall inquiry by the claim that his answer might tend directly or indirectly to convict him of criminal conduct, any state or federal statute to the contrary notwithstanding. And if his answer may have that effect, the tribunal would be obliged to excuse him from further examination on the point. But suppose the witness is called to testify,

as an officer or agent of a corporation, as to a criminal act of the corporation, for which the witness is in no degree responsible, and of which his answer could not tend to convict him personally. Can the corporation claim exemption on the ground that an examination of its officer or agent as to corporate matters is an examination, in effect, of itself, seeing that a corporation can act only through its officers and agents? In other words, when the Constitution of the United States provides that no *person* shall be compelled in any criminal case to be a witness against himself, does it include an *artificial* as well as *natural* person?

If it be conceded that a corporation cannot be guilty of a criminal offense, and so cannot be capable of being a defendant "in a criminal case," it needs no argument to see that a corporation is not within the purview of the constitutional provision and so cannot claim the protection of it. But there are many criminal offenses of which a corporation may be guilty or for which it may be indicted, and the tendency of legislation is toward a constant increase in the category of corporate crimes, with corporate penalties attached.

It may be contended in favor of the corporation that to the extent to which it may be indicted it should have the benefit of the great principle of freedom from compulsory self-conviction embodied in the federal constitution, and since it is subject to the evil it is entitled to the remedy. But, on the other hand, it may be said that the text of the provision in question excludes its application to corporations, and that the visitatorial powers of the State necessarily imply an inquisition into corporate abuses, and these artificial creatures of the State accept their charters with the implied promise to submit to such examination of their affairs as the State may see fit to make, without regard to the consequences.

The question suggested opens a wide field of technical discussion which we must leave to the lawyers and the courts. But two things impress us as reasonably clear: First, that the railroads of the whole country have important questions to consider arising out of the Counselman case; and, second, that that case will necessitate an extensive and important revision of the statutes of this and most of the states of the Union.

A Study of Zone Tariffs.*

The subject of "zone" and other reformed passenger rates having been discussed by pretty much all the world—the German world at least—that is ignorant of the whole subject of rates, it was quite time that it should be taken in hand by some one who is an expert in the matter. Such, if any one is, or should be, Mr. Franz Ulrich, one of the officials in the Prussian Ministry of Public Works, who published in 1886 an extensive treatise† covering the whole question of railroad rates, freight and passenger, theoretically, practically and historically, in which he gave a full account of the systems of rates actually in force in all countries of the continent of Europe except Russia; while in a French translation‡ which has appeared since he has also treated the Russian rates, which are not the least interesting. Naturally the Prussian Ministry of Public Works possesses all the data accessible to anyone on the working of the new systems of fares in Hungary and Austria, which, by the way, are not by any means as complete as was to be expected, and Mr. Ulrich has studied them thoroughly and presented the results fully and fairly.

In this country, when a "zone" tariff is spoken of, people usually understand something like the new Hungarian or the newer Austrian system. This is not the case in Germany. There have long been there certain men who apparently made it the business of their lives to advocate something like a letter postage system of fares, making only two or three rates for a whole country; they have published numerous books and pamphlets, and one of them, who has recently died, issued a monthly journal in advocacy of his scheme. These people, who perhaps would be called "cranks" in this country, have had the public ear, so that the German people had become familiar with their projects; and when they heard that Hungary and Austria had adopted "zone" tariffs, they naturally supposed that these were something like what Perrot, Engel and Hertzka had been talking about so long. In fact, however, the only point in which they resemble each other is in the fourteenth zone of the Hungarian tariff, in which the fare is the same for all distances of 140 miles or more.

Perrot's first proposition was to make only two rates, one for distances of 47 miles and under, the other for all greater distances; for the first he would charge 72, 12 and 7¼ cents, for the three classes respectively, and for the second $1.44, 24 cents and 12 cents, respectively. Twelve cents for a journey of several hundred miles, for which there was opportunity in Germany, would be cheap traveling indeed, and such a fare in this country would, we imagine, put an end to the tramps stealing rides, of which we hear so often now-a-days. Perrot, however, was so in love with his idea that he applied it to freight traffic also, making three zones, the first of 93 miles or less, the second over 93 and less than 233 miles, the third all greater distances. For these three zones the rates would be: For shipments of 330 lbs. or less, 12, 19 and 29 cents; for a carload (22,000 lbs.) $3.60, $5.76 and $8.64. This might be proposed to Governor Boyd as just the thing to make the Nebraska corn growers happy; 3½ cents per 100 lbs. from anywhere to New York or San Francisco ought not to be burdensome to them. To be sure Perrot was not making rates for so big a country as this, but to make such figures for a country less than a thousand miles long even, indicates his state of mind.

Recently, after the experience with the new tariffs in Hungary and Austria (and just before his death), Perrot revised his scheme for passenger fares, which evidently would be destructive for short distance traffic, which is that most capable of growth. He proposed a system of low rates for local traffic, similar to that of the Hungarian tariff (which is separate from its zone tariff, and has caused an enormous increase of short distance travel there), and then made *three* zones, measured by the number of stations instead of the distances, charging 12, 24 and 48 cents for a journey not beyond the tenth station; 24, 48, and 96 beyond the tenth and not beyond the twentieth, and 60 cents, $1.20 and $2.40 for journeys to all stations beyond the twentieth. This made the second and third class fares for the longest journeys *five times as great* as by his original scheme, which indicates that he had learned something before he died; and not all of us do that.

It is hardly worth while to present the schemes of the apostles of the genuine zone tariffs, further than to say that Engel, who is now most prominent, would make rates the same for all distances over 31 miles, and Hertzka would make only one class and then charge 4 cents for all journeys of 18.6 miles or less and 10 cents for all longer journeys within the kingdom of Austria.

With the popular pressure for a reduction of fares which is now evident in all North German countries, which feel as if they had suddenly been surpassed by their southern neighbors, where heretofore fares had always been higher, it was important to let them know what the Hungarian and Austrian rates actually are, and how remote is their relation to the "zone" tariffs of which they have heard so much.

As we have said before, all distance tariffs are "zone" tariffs, and with exceptions to be named the Hungarian and Austrian tariffs are distance tariffs in which the units of distance are longer than in the old kilometre tariff, and more like the old North German tariffs which made the rates per German mile = 7½ kilometres. There is the added feature that beyond a certain distance the same rates hold good for a longer distance, but not so as to make a less rate per mile for long distances, but a greater one; for the fare for each zone is at the regular rate for the *greatest* distance that can be traveled in that zone, which makes a considerable difference when the zone is as much as 31 miles long, and the passenger (as in Austria) who travels 125 miles pays for 155 miles, and at the same rate as if he only traveled 6 miles. The great exception is the famous fourteenth Hungarian zone, which enables you to go any distance over 140 miles for $1.63 third class, *provided* that your route does not take you *through* Budapest or Agram, which substantially cuts in two all journeys between the East and Vienna and between nineteenth-twentieths of the kingdom and its sole port, Fiume—doubtless wise limitations to the effect of the fourteenth zone, which otherwise would have been made it nearly as cheap to go to Vienna from all Hungarian stations at a little distance from Budapest as to go to Budapest, which would, have have been a terrible blow to that thriving and ambitious city—the Chicago of Southeastern Europe. That would have been as if the State of Pennsylvania should make fares from all points in the state as low to New York as to Philadelphia; a proceeding which would not be likely to receive the approbation of Philadelphians.

The local tariffs of Hungary, making two special rates, outside the zone tariff, one to the nearest station and the other to the second, whatever the distances between stations, differ from anything in the original schemes of the zone apostles, and has been the particularly fruitful feature of the reform, and doubtless is of immense advantage to the Hungarian public and has increased the profits of the railroads. This is the feature of the Hungarian tariff which most deserves attention and possibly imitation. The true tariff policy is to make rates which will most completely develop traffic, so long as it produces sufficient net earnings. Reductions of rates which do not increase traffic are failures, whether the distances are great or small. We should hunt for passengers where passengers are to be found; and the Hungarian experience shows that there, at least, enormous numbers were to be had to ride between stations only a little way apart, and that a rate per mile *less* for short than for long distances was perfectly justifiable.

Ulrich reviews all the "postal" schemes, if we may call them so, which have ever been proposed, so far as he can find them, and he has found a good many; but the value of this part of the work is chiefly to show the disciples of Engel, etc., what a world-wide difference there is between their systems and those recently tried which have attracted such universal attention. The most valuable part of the book is that in which he discusses the accomplished facts in Hungary and Austria, and those of the Prussian State Railroads which have a bearing on economy of passenger transportation. As to the practicability of keeping trains fully loaded, he shows that on the Prussian system the amount of travel varies enormously from month to month, and consequently still more so on different days. In 1888 the passenger mileage fluctuated between 263 millions in November and 650 millions in August; in 1889, between 197 and 447; in 1890, between 240 and 490 millions. People will not take their vacation journeys in winter, and the suburban trains run empty into town in the evening and empty into the country in the morning. The holiday excursion trains are crowded if it is fine and empty if it is raining, and people are not less particular when travel is cheap than when it is dear in choosing the time that suits them for their journeys.

A particularly interesting table presented by Ulrich shows the highest and lowest proportion of seats occupied on the several trains run on each of the eleven different systems into which the Prussian State Railroads are divided. How irregular this proportion is a very few examples will show. Between Hamburg and Berlin is the express train of the Altona directory, which runs fullest on the average, and it has 62.6 per cent. of its seats occupied; that which runs emptiest, so to speak, runs between Neumünster and Kiel, and has 9.8 per cent. of its seats occupied. On ordinary passenger trains the highest and lowest percentages are 55.8 and 6; on mixed trains, 45.2 and 4.1. Similar divergences are seen in the systems of the other directories, the greatest variations in the same directory (that is, under the same management) being 88.8 and 6.2 and 73.2 and 2.9 per cent. in express trains, 88.3 and 0.9 (!) in ordinary trains, and 91 and 4.3 per cent. in mixed trains. We do not know that any data concerning the same subject have ever been published before, and they certainly show very clearly how very little travel some trains are able to get which still, for various reasons, it is thought necessary to run.

Previous to the present tariff the Hungarian fares were among the highest in Europe, the basis of rates being 3.28, 2.30 and 1.64 cents per mile for ordinary trains, 16 per cent. more for express trains, and for mixed trains 10 per cent. less for the first class, 14 per cent. less for the second class, and 28 per cent. less for the third class, to which were added a government tax of 18 per cent. and a stamp amounting to one kreuzer (0.4) for every 50 kreuzers. The new tariff made an enormous reduction in these rates. Ulrich has computed the average ratio *per kilometre* for each zone, and these are found to be beyond the first zone of 15½ miles (in which there is no travel except by express trains, because it is much cheaper to travel than by the local station to station rates) moderately increasing up to the fourteenth zone. Thus for the first class by ordinary trains the rate per mile is 2.085, and increases by a slight amount for each zone up to 2.166 cents for the thirteenth zone. For the first kilometre of the fourteenth zone (140 miles) it is 2.324 cents per mile, and then of course decreases rapidly with the distance traveled, becoming 0.703 cent. for 463 miles, which is the greatest distance it is possible to travel for one fare by the Hungarian tariff. So the rate per mile between the first zone and the twelfth varies from 1.664 to 1.722 cents for the second class; and from 1.04 to 1.08 cents for the third class; for express trains it is 25 per cent. more. If we take the figures 2.124, 1.70 and 1.06 cents for ordinary trains, and 2.55, 2.124 and 1.274 for express trains, we shall have almost exactly the average Hungarian zone rates inside of the fourteenth zone.

Ulrich has not been able to give the monthly passenger movement and earnings under this tariff except for the first seven months, which is much to be regretted, but for this period he gives the number of passengers of each class and the earnings from them, in each zone by both express and ordinary trains.

The increase in journeys of more than 139 miles was naturally very great. In the first entire year of the new tariff the number of these journeys more than trebled, and the receipts from them doubled. The whole number of these journeys was about 500,000, and the average fare received about $2.10. The increase in passenger earnings was especially large in the local travel between places not more than two stations apart. In the zones proper there was an increase in earnings only in the eighth, the thirteenth and the fourteenth. From journeys in the first seven zones (71 miles or less), and the ninth, tenth and eleventh zones (81 to 109 miles) there was a *decrease* amounting in the aggregate to about $260,000, or just about the gain made in the short traffic not carried at zone rates, but for distances which come generally within the first zone or a little beyond it. Then the gain in the thirteenth zone was about $150,000, and in the fourteenth $525,000. The amounts are not very large for a system of 3,700 miles, but the percentage of increase is large, the travel previously having been light and decreasing, as may be seen from the following statement of the average daily movement of passengers in each direction of the Hungarian compared with the Austrian and the Prussian State systems.

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* Personentarifreform; und Zonentarif. Von Franz Ulrich. Berlin, Julius Springer, 1892.

† Das Eisenbahntarifwesen im Allgemeinen und nach seiner besonderer Entwickelung in Deutschland, Oesterreich-Ungarn der Schweiz, Italien, Frankreich, Belgien, den Neiderlanden und England. Von Franz Ulrich, Berlin and Leipzig, 1886.

‡ Traité général des tarifs de chemins de fer; par F. Ulrich, Paris, Baudry et Cie, 1890.

	1885.	1886.	1887.	1888.	1889.	1890.
Hungarian.....	130	115	106	97	130	167
Austrian.....	175	173	168	167	176	228
Prussian.....	334	348	352	363	398	427

Hungary, thus, in the year before the new tariff was adopted, had 40 per cent. less passenger traffic per mile of railroad than Austria, and little more than one-fourth as much as Prussia. And after the great increase following the reduction of fares, it still had 60 per cent. less than Prussia, where very slight changes in rates have been made, but where the very low rates of the fourth class (0.77 cent per mile), which does not exist in the other countries, have been extended. Dating from 1885, the Prussian system has gained absolutely and proportionally more than either of the others, but on it the growth has been gradual and uninterrupted; while in Hungary travel fell off 25 per cent. from 1885 to 1888, so that the whole increase was made at a bound, as it were. But ever since 1888 travel per mile has grown almost as much in Prussia as in Hungary.

Indeed, the average rates are very nearly as low in Prussia, where the larger part of the travel is on round-trip and other reduced-rate tickets, and where the enormous fourth-class traffic brings down the average. The average actual earnings per passenger mile in 1890, by the reports made for the statistics of the German Railroad Union, were 1.073 cents on the Hungarian, 1.162 on the Austrian and 1.143 on the Prussian state systems.

What has caused the success of the new systems is not their zones, but the great reduction from the old rates, which has made possible a great amount of traveling that could not exist under the old rates, an increase, that in Hungary certainly, and in Austria probably, in a short time, if not immediately, will make the profits of the business as great as at the old higher rates. It is not a practical question whether the railroads make as much profit from the passenger traffic as they "ought" to. There they are, and if the people will not travel at a high rate, the only rational course is to make a rate at which they will travel, provided it more than covers the actual working expenses. This is a safe principle to work by not only in a thickly peopled country, but anywhere; for everywhere a little profit is better than no profit at all. The Hungarian railroads still have very light passenger earnings for a European country with a population of something like 2,000 per mile of railroad, but they have more than they used to have, which is a sufficient justification for the change in rates taken as a whole. Probably the most peculiar feature of their system, the fourteenth zone, will not be imitated anywhere; but the plan of reducing rates when it will largely increase travel is likely to be followed the world over wherever transportation is rationally conducted. This does not mean by any means that rates should be revolutionized periodically; for with intelligent traffic management the changes of rates are likely to follow closely the changes which make growth of traffic possible, and these usually are gradual.

Power Distribution by Compressed Air.

An ordinance has been passed and signed by the Mayor of Chicago giving permission to a company known as the Chicago Power, Supply and Smoke Abating Co. to lay pipes in the streets of that city for the transmission of compressed air as a motive power for machinery. This ordinance has been passed under the guise of a smoke prevention scheme, but there is not much likelihood that any great results will be accomplished. It is obvious to all who are acquainted with the subject that a compressed air system will not result in materially decreasing the smoke nuisance in any city where soft coal is used, for the reason that there are large plants requiring so much power that compressed air could not be furnished at a cost which would be reasonable.

The proposed system of distribution is like that used in Paris (the "Popp"), the use of which is confined chiefly to extremely small motors, fans, clocks, ventilation, etc. It would be impossible to furnish air at a cost that would permit its use for large power plants such as are now found in the office buildings and in the various manufactories in the city of Chicago. Even in the thickly settled business and manufacturing portions, where the steam plants are close together and the cost for piping and conveying air would be a minimum, to furnish sufficient power by compressed air is impossible. There are probably 400 buildings within a short radius of the central portion of the city using from 200 to 3,000 horse-power continuously for the purpose of driving elevators, pumps and machinery and for heating. This would call for a central station having an effective capacity of at least 300,000 horse-power at the points where the power would be distributed, which would amount to about 600,000 horse-power in the boilers of the central station. Thus the proposition quickly reduces to an absurdity. Undoubtedly there are uses for which compressed air will be valuable in Chicago or in any other city, but its introduction would have little or no effect upon the smoke nuisance.

The efficiency of a compressed air motor taken from the steam engine is very low. It is doubtful if more than 25 per cent. of the power of a steam engine could be recovered after that power had been transformed through an air compressor, through the city mains and through the local compressed air motor. And this efficiency would only be obtained with motors of considerable size. If a system of power distribution from a central station is needed in Chicago it is to be wondered at that electricity is not selected as a means for conveying power, as electric motors have from 40 per cent. to 50 per cent. efficiency from the steam engine, allowing liberally for all possible losses except that of leakage.

There may be something behind all this talk about power distribution by compressed air, and it is hinted that the intention of the power company is to use the ordinance for a quite different scheme from that proposed and, further, the pipes apparently for air may be used for electric wires.

The Massachusetts Railroad Commissioners in their annual report, just published, speak of commutation and mileage tickets as founded on the general principle that the person who wishes to buy at wholesale ought to be able to purchase at lower rates than one who buys at retail. This, they say, is a sound principle "and the conviction of its justice is firmly fixed in the minds of the people." Whereupon the Springfield *Republican* brings up the opposite theory, as set forth by Interstate Commerce Commissioner Knapp in an interview, as follows:

> The difference between wholesale and retail is never recognized in fixing the compensation for any service which the state performs, and thus equal right and opportunity are secured to all. The large shipper is entitled to no advantage over the small shipper in respect of rates or accommodations, any more than the man who mails 1,000 letters a day is entitled to lower postage than he who sends only one a month. To allow any exceptions to this fundamental rule is to subvert the principle upon which free institutions depend.

And the *Republican* wants to know which is the right view. In the first place it may be said in passing that "the people" whom Mr. Crocker finds with a belief in the wholesale principle firmly fixed in their minds, are, doubtless, those few who realize the truth that business must in the long run be done economically to succeed, or else those others, neither very few nor very numerous, who enjoy some benefit from reduced rates. "The people," the great majority who vote, and influence legislators, and buy one ticket at a time—and at very infrequent times—doubtless have a firm conviction that they, themselves, ought to receive the lowest of all rates, such as Mr. Knapp desires to give them. The only rule that is certainly applicable in all cases, is that a railroad should be permitted to make wholesale rates when the principle can be applied without injustice to the small purchaser, and in such a way as to enable the road to improve the quality or reduce the price of its service to all. Suburban rates at half a cent a mile do no injustice to the transient passenger because they are the direct cause of increasing the number of trains and thus giving him more conveniences for his money. Thousand-mile and ten-ride tickets save the company some work and are justified on that account, and at the same time tempt people to travel more than they otherwise would, thus again giving more facilities for the transient passenger. The discount on thousand-mile tickets is, however, too large in some cases. When a merchant in New York pays $20 for postage on 1,000 letters it is, indeed, a case of the rich favoring the poor; the merchants are rich in transportation facilities, and pay a high rate to favor the remote farmer or miner who is poor in transportation facilities. The Government can, in like manner, direct a railroad to carry farmers cheaply in Kansas because it makes wholesale rates for people who travel a good deal within ten miles of Chicago, but experience like that in Iowa shows that such compulsion may very quickly overreach itself. The people of that state who have secured low rates for themselves have done it at the expense of their less fortunate neighbors, who need new railroads but have to go without them because the enforced low rates have scared off capitalists. Josh Billings, or some other philosopher, said that gambling was safe "provided you never venture more than a nickel; a dime is sure to be fatal." Compelling those who have made money to divide with those who have yet to make it, works allright as long as you stick to two cent items—postage stamps; but when you come to try it on a larger scale it is "flyin' in the face of natur'."

A number of superintendents and car service managers met at Chicago, Feb. 29, and agreed upon a memorial to be presented to the Car Service Committee of the American Railway Association, recommending rules for preventing abuse and diversion of cars. The principal paragraph of the document is that providing for a charge of 50 cents a day on each foreign car detained more than 30 days on one road, including foreign cars detained for repairs more than a reasonable time. Cars refused and cars containing freight refused to be subject to the same rules after three or five days. A resolution was passed, to the effect that "the establishment of foreign lost car agency bureaus increases the difficulty of handling equipment, and that it is the sense of this meeting that they should not be further encouraged." The gentlemen present at this meeting were: C. W. Kouns, W. C. Nixon and E. Copeland, Atchison, Topeka & Santa Fe; D. Maroney and R. B. Campbell, Baltimore & Ohio; A. R. McIntyre and D. Howard, Chicago & Grand Trunk; G. E. Simpson and W. E. Beecham, Chicago, Milwaukee & St. Paul; F. M. Luce, Chicago & Northwestern; J. E. Rose, Cleveland, Cincinnati, Chicago & St. Louis; E. G. Russell and J. M. Daily, Illinois Central; D. W. Rider and F. M. Benning, Jacksonville Southeastern Line; Charles E. Wheeler, Lake Shore & Michigan Southern; T. E. Clarke, Minneapolis & St. Louis; S. H. Church, Pennsylvania Co.; N. K. Elliott, Vandalia Line; F. J. Hawn, Wisconsin Central.

The 30-day period which is here recommended has been mildly criticised on the ground that a hundred-mile road, whose legitimate use of a car would require, say, six days, is placed on a par with a thousand-mile road, which could reasonably keep a car twice that length of time. The trouble, however, is to secure the adoption of any kind of a penalty clause. It behooves all interested officers to work for the adoption of any proposition that is good in the main, trusting to time for the correction of faults of detail. The system of demurrage charges, which is doing more good than any other recent innovation in car service matters, has many inequalities about it, but its results are good in spite of that fact. Indeed, one reason for its success is the simplicity of the plan, notwithstanding that the simplicity is obtained partly at the expense of equity.

The Massachusetts Railroad Commission gives more than 40 pages of its annual report to an investigation of the "zone" fare system, which would hardly seem to be a living question in this country; but the Commission was not left to its discretion in this matter, for the investigation was ordered by the Massachusetts Legislature, doubtless to satisfy a public demand, which was shown by the fact that when the Commission gave a public hearing on the question last November, "duly advertised in the daily papers," nobody appeared to oppose the adoption of the zone system—and nobody to advocate it. The Commission, however, proceeded with its investigation right thoroughly, with the result that it has given quite fully the data relating to the subject, and some of the most valuable German discussions of it, completing its work too early, however, to take advantage of Ulrick's just published work, which we have discussed elsewhere. It has also made elaborate comparisons of Hungarian and Austrian with Massachusetts fares, and particularly with Boston suburban fares, coming to the general conclusion that the Massachusetts rates are better for Massachusetts than the Hungarian or Austrian rates would be. The apparatus for reaching this conclusion seems needlessly elaborate, like a twelve-pound howitzer trained on a sparrow, but probably the Commission wished to make sure that the work need not be done over again. It has this value, at least, that it gives us an account in the English language in considerable detail of a matter which has had a great practical effect on railroad traffic in two European countries, and is almost sure to modify rates in all the principal ones on the Continent. It also illustrates these rates by applications to Massachusetts lines, and gives some valuable data as to the latter, as, for instance, that the passenger earnings of five principal Boston railroads between Boston and stations within 15¼ miles (equal to the first Hungarian zone) were $3,248,752 last year, which was nearly one-sixth of their total passenger earnings, while by the Hungarian second-class rate it would have been about one-half more. The report is accompanied by a large number of diagrams on large sheets, which perhaps make clearer what is easily understood without them.

The Hungarian passenger traffic continues to grow. Last January 1,925,500 passengers were carried, against 1,401,400 in 1891, an increase of 37 per cent., and this in the third year of the zone tariff. The increase in earnings was 22 per cent., showing that the growth is in the travel for short distances. The traffic was about one-half greater than in the month when it was greatest in the first year of this tariff (September, 1889), though January is one of the worst months for travel. The earnings, however, were but 45 per cent. more than in September, 1889. Meanwhile there has been a considerable increase in the mileage under the zone tariff. The average receipt per passenger was 25.3 cents last January, 28.4 in January, 1891, and 31.2 in September, 1889. The largest average receipt per passenger was in the first month of the new tariff, namely, 36.5 cents, in August, 1889. Naturally, those who had journeys of considerable length to make put them off, as far as possible, until they could secure the enormous reduction made for such journeys by the zone tariff, which is the same for all greater distances as for 140 miles. But nothing is shown by the history of this tariff more clearly than that the long distance journeys are but little desired in Hungary, and that that part of the business is conducted at a great loss. It is the short traffic which grows and which pays.

The weekly capacity of furnaces in blast on the first of this month, 193,827 gross tons, was the largest in our history. This makes our probable production for the three months ending with February two and a half million tons ore, more than any calendar year's production up to 1879. But unfortunately the demands of consumers are not equal to the production and the Cleveland *Iron Trade Review* publishes a list of 14 furnaces that have blown out since March 1, or will blow out within 30 days, and, though others are known to be preparing to blow in, production will undoubtedly be diminished for some time. The slow consumption is partly due to the restricted demand for rails which is consequent on the artificial price maintained by the steel rail makers of this country. It will be noticed that steel rails are now held at more than twice the price of the

Bessemer pig from which they are made, whereas a difference of from 1.6 to 1.7 affords, it is understood, an ample margin of profit for the manufacturers; and as a matter of fact it was the ruling rate for some time before the enactment of the McKinley bill. Blooms and billets have not maintained their price with steel rails. They are quoted in Pittsburgh at $23 @ $23.25, while muck bar is held at $25. As a result many puddlers are losing their jobs, the furnaces being dismantled in some cases.

The Russian government has commissioned General Annenkov, the famous builder of the Trans-Caspian Railroad, to conduct an enterprise which is intended to give immediate employment to a number of the sufferers from famine and to lessen the chances of the repetition of such a disaster. The men are to be engaged in felling trees and getting out timber on some 60,000 acres of government forests, which is expected to cost some $1,600,000; and with the timber and the proceeds of its sale, grain elevators are to be built at 22 different stations. The timber got out, it is estimated, will bring about $3,000,000, and in the estimate we notice that ties are reckoned worth 10 cents apiece, at which rate we are sure we would trade for ties corn enough to make all the sufferers fat. Besides this logging job, a number of roads and bridges are to be rebuilt and new ones built, for which $1,115,000 are appropriated. Some of these enterprises were planned about 1870, when Russia had something like a "boom" in construction; but since the last war with Turkey it has been very difficult to get capital for any enterprise; otherwise that vast country with a population of 90,000,000 would doubtless have more than 18,200 miles of railroad.

Greenwich time will be introduced May 1 next on all Belgian railroad lines. This is the time recommended for France, which, however, seems indisposed to consider it even. The indications now are that what we call "standard time" will prevail throughout central Europe, having Russia on one side and France on the other with local time. Spain and Portugal, connecting with French railroads only, will gain nothing by changing until France does. It must be confessed that Paris time (used uniformly on French railroads) is more convenient for France than Greenwich time, about four-fifths of France lying east of the meridian of Greenwich. Still Nice, near the extreme east, has but 30 minutes difference from Greenwich in local time, which will be about the variation of Turin from the "Central European time," which is to prevail in Italy, Austria-Hungary, Germany and the Scandinavian countries. More than nine-tenths of Italy is west of this meridian, which passes through Mt. Etna, but only a small part of it is as much as 20 minutes (in time) west of it.

Another car coupler bill was introduced in the United States Senate on Monday of this week. It provides that the standard coupler shall be decided by a letter ballot of all the railroads, to be sent to the Interstate Commerce Commission by July next, who shall decide the ballot and the validity of the votes. The votes shall be based upon the number of freight cars owned by each company. If the roads fail to establish a standard type, then the type shall be the master car builders' type. It will be seen that the chief aim of this bill is in the line of that proposed by ex-Railroad Commissioner Crocker, of Massachusetts, but with the important difference that the vote of the roads must be taken a year earlier than was proposed by Mr. Crocker. The bill was introduced by Senator Allison, of Iowa, a state which is not wholly unknown to fame as the source of propositions of this kind.

February gross earnings, as reported by *The Chronicle*, increased $4,626,468, or 13.43 per cent. over last year, but there was one more working day in the month and last year the weather was much worse. The gain was very largely due to the heavy grain movement. The receipts of wheat at the primary markets were 11,300,000 bushels this year, against 5,700,000 last year. The receipts of corn were 13,100,000 bushels in '92 and 6,750,000 in '91. The cotton movement also was very heavy.

NEW PUBLICATIONS.

North Carolina Railroad Commission: First Annual Report.

The substance of this report is very short, the few facts given in it having been reported in the *Railroad Gazette* of March 11. The full volume, which has since come to hand, is worthy of a passing note by reason of its being the first issued in that state. The four pages of the report are followed by 660 pages of appendix, which include, besides the detailed reports of the several railroad companies, the full text of the laws creating the Commission, the rules of practice before it, and the complete passenger, freight and other tariffs prescribed by the board for the railroad, express and telegraph companies of the state. The freight classification is followed by a small dictionary defining some of the unfamiliar words in it. 'Cordage" we find is a quantity of ropes or cords, and "tapioca" a kind of farinaceous food.

TRADE CATALOGUES.

Bush Cattle Guard Co., Kalamazoo, Mich.—This company has issued a neat pamphlet descriptive of its steel cattle guards, which has the merit of both brevity and completeness. It clearly describes, by text and illustration, the construction of the cattle guard, and yet can be quickly grasped by the hurried reader. It is announced that the patent litigation which has heretofore hampered the company has been settled, and that 3,000 guards have been put in use on 43 different roads. This is a surface guard, but the ballast is excavated under it to about one-half of the depth of the sleepers, and the space thus afforded is said to prevent the passage of small animals and to sufficiently frighten large ones.

The Niles Tool Works, Hamilton, O., have issued a beautiful catalogue of their machine tools. It is bound in cloth and has 244 pages. In addition to the usual illustrations and descriptions, there is considerable argument as to the best tool practice for railroad and other shops.

How Prussian Railroad Employes May Be Heard.

The Prussian State Railroad management, with its 180,000 workmen, aside from its 90,000 regularly appointed employés, naturally finds itself interested in the "labor question." Recently the Minister of Public Works has issued a circular regulating the representation of these employés. It directs that to give the workmen employed in any shop or other establishment of the State Railroads opportunity to present their wishes or complaints through representatives of their own choice and to give their opinions on questions which regard their welfare on the request of the authorities under whose direction they work, they are, where as many as 20 are employed, to choose a committee from their own number. Where there are several shops, etc., in one place, they may choose a joint committee; and also, when it seems advisable, a joint committee may represent establishments in different places. The State Railroad directories will fix the number of members of each committee and its headquarters, and have power to change the limits of the territory represented by a committee. Each committee shall consist of not less than three nor more than 15 members, the number to be fixed by the state directory in proportion to the number of employés represented.

Every employé over the age of 21 who has been for three years in the State Railroad service is entitled to vote for members of the committees, provided he has the full rights of a Prussian citizen. Those eligible for committeemen are workmen not less than 30 years old who have been in the State Railroad service five years and for the last year in the same shop, and are citizens. The vote is by secret ballot, the leading officer of the establishment presiding at the election, assisted by two workmen. In great shops, etc., the men may be divided into groups according to occupations, etc., each of which will choose a representative and an alternate. When several shops in different places have a joint committee, each establishment will select one member. A week's notice of the election will be given by the official authority—either a State Railroad "directory," which has charge of a system of 1,200 to 2,000 miles of railroad, or an "Operating Bureau," which has charge of a division under a directory. With the placard giving notice of the election is to be posted a list of those entitled to vote and those eligible as committeemen. A majority elects, and if no candidate has an absolute majority, another ballot is taken as soon as possible, at which only the two who had the largest number of votes are eligible. The persons elected are to announce their acceptance immediately after the election. The term of the committeemen is three years. Their mandate expires when they are no longer employed in the establishment in which they were chosen, by resignation, or by incapacity for service, or leave of absence for more than three months; by a condemnation punished by imprisonment, or by promotion into the class of regular employés (officers).

The committees are to present to their respective superior officers the propositions, desires and complaints made by their members which affect the workmen in their shop or the district which they represent, and to discuss these propositions with such officers; give their opinion on other questions affecting the workmen, especially on regulations to be issued for preventing accidents and others made for the welfare of the work-men and their families; and, further, when called upon by both parties, to arbitrate disputes between fellow-workmen. In the first two cases, the officer in charge of the establishment may call in other workmen of the same establishment, but these may not vote on the decision.

Ordinarily the committees will not meet more than once in three months, unless the authorities call for a a meeting, or two thirds of the committeemen demand one. An officer appointed by the chief authority of the establishment presides over the committee's proceedings and fixes the time of meeting and the order of business. The authority in charge may also appoint other officers to take part in the proceedings. These proceedings are to be recorded, with the votes taken on each question. If anything voted requires the decision of a superior authority, a copy is to submitted to such authority, accompanied by the opinion of the officer in charge of the establishment whose workmen are represented by the committee. Sessions are to be held, so far as possible, during working hours, for which full pay will be allowed. If the duties of committeemen require them to travel, they will receive free tickets and allowances, the same as for other service.

The State Railroad directories are authorized to dissolve any committee which in its opinion has shown itself unfit to fulfill the duties required of it, and then order a new election.

The Improvement of the Hudson River.

The report of the Board of Army Engineers, Colonel Gillespie and Majors Stickney and Raymond, appointed to examine the obstructions in the Hudson, from the State dam at Troy down, and to make an estimate of the cost of widening and deepening the river for vessels drawing 20 ft., and also for a channel 12 ft. in depth, is at hand. The Board found that there was no obstruction below Coxsackie, and decided on a depth of 22 ft. and 400 ft. width as necessary for vessels drawing 20 ft. of water. Their estimate for this channel to Albany is:

17,746,080 cu. yds. dredging, at 20c	$3,549,216
146,610 cu. yds. rock at $10	1,466,100
Regulation works	350,000
Contingencies, 10 per cent	559,532
	$5,934,848

And between Albany and the State dam:

7,940,387 cu. yds. dredging, at 20c	$1,588,077
1,075,100 cu. yds. rock, at $10	10,751,000
Contingencies, 10 per cent	1,233,908
	$13,572,985
Grand total	$19,507,833

The estimate for a channel 12 ft. deep from Coxsackie to the State dam, 400 ft. wide to Broadway, Troy, and 300 ft. wide thence to the State dam is as below:

4,620,048 cu yds. dredging at 20c	$924,010
95,136 cu. yds. rock at $10	951,360
Regulating work	350,000
Contingencies, 10 per cent	222,537
Total	$2,447,907

From which it appears that a channel 22 ft. deep up to Albany and 12 ft. deep thence to the State dam would cost $7,562,594.82. The Board recommends the 12 ft. channel. It divides the traffic into two parts, local, supporting a commerce of 15,033,309 tons and about 5,000,000 passengers; and the through traffic which is derived from and enters the State canals, this amounting to 3,592,437 tons. The whole amounts to 18,625,746. This the Board points out is the most important freight route in the world, excepting the Detroit River, The report refers to the advantage which would be derived from adopting Mr. E. Sweet's plan for the radical enlargement of the Erie Canal, by feeding it all the way from Lake Erie, as set forth in the transactions of the American Society of Civil Engineers for February, 1885, and in the appendix is the following table contributed by Mr. Bogart, State Engineer, showing the appropriations for the following rivers up to 1890, with the tonnage on each of them.

Rivers.	Appropriation.	Tonnage.
Mississippi not including jetties and river commission	$35,461,980.53	13,000,000
Missouri	5,551,100.00	865,493
Ohio	4,986,479.25	6,000,000
Hudson	1,516,438.00	18,625,746

TECHNICAL.

Manufacturing and Business.

The Trenton Iron Co. reports large orders for wire rope for factory and mine tramways, and it is now building a line 8,250 ft. long for the Amethyst Mining Co. in the new Creede camp in Colorado with a capacity of 200 tons a day; a line 5,150 ft. at Ouray, Colo., with a capacity of 200 tons a day, and also for the Haggin mine in Mexico, having a capacity of 100 tons daily and a length of 5,980 ft. The company also has under contract a large cable hoist for the Avondale Stone Co., of Pennsylvania, and has just completed a duplicate one for the Passaic Quarry Co. It is also duplicating the large cable transfer over the Susquehanna River at Williamsport, and it has other orders, including a large haulage plant for the Croton Falls Magnetic Iron Ore Co., near Brewsters, N. Y.

The Southern Equipment Co., of Chattanooga, reports that it has recently taken orders from the Barney & Smith Mfg. Co. for 600,000 ft. of lumber for framing cars, and from the Lima Car Works for 200,000 ft. of lumber.

The firm of F. A. Barbey & Co., at 178 Summer street, Boston, has succeeded the firm of Bryant & Barbey, which was dissolved March 5, by mutual consent. Mr. George H. Bryant's headquarters will be at 703 Phœnix Building, Chicago, he having become connected with the Q. & C. Co., which will control the Bryant rail saws.

The rail drills made by Frank Reed, of Worcester, Mass., are now being successfully used in the shops of the Delaware, Lackawanna & Western and several other railroads and in electric railroad work. The drills were first manufactured last November.

The Detroit Foundry Equipment Co., Detroit, Mich., has recently shipped a large order to Brazil, South America, consisting of improved power cranes and general foundry equipment.

The Hogeland Cushion Car Wheel Co., of Chicago, has been organized with a capital of $25,000 by Israel Hogeland, D. W. Wood and M. H. Rylott.

The Anniston Rolling Stock Co., of Anniston, Ala, has a contract for 6,000 axles.

Messrs. Post, Martin & Co., of 45 Wall street, New York, have established a special department under the charge of Mr. Robert Colwell, for the purchase and sale

of railroad equipment and rolling stock, new or second hand. Mr. Colwell, from 1880 to 1889 was a member of the railroad supply firm of Colwell & Canning.

R. D. Johnson, J. H. Johns and S. M. Evans have incorporated the Birmingham Bolt & Nut Co.

The Philadelphia Engineering Works have opened a branch office in the Phœnix Building, Chicago, in charge of Mr. Lindsay, one of the firm.

The Washington Construction Co., of Seattle, Wash., has been organized by George Atkinson, Jr., B. Pelly, C. T. Tyler and E. B. Downing. The capital stock is $250,000.

The Springfield Iron Co., of Springfield, Ill., is putting in additional machinery for manufacturing track bolts, and is making other improvements which will increase the output of that department over 50 per cent.

William Tod & Co., of Youngstown, O., received an order last week for a 2,300 H. P. engine for Carnegie, Phipps & Co., of Pittsburgh, which concern has ordered 22 engines of the firm in the last four years.

At a meeting of the Board of Directors of the Union Switch & Signal Co., March 1, George Westinghouse, Jr., was elected President; E. H. Goodman, Vice-President and General Manager, and Messrs. A. M. Byers, Thomas Rodd and James H. Willcock, all of Pittsburgh, Executive Committee.

The Congdon Brake Shoe Co., of Chicago, is erecting an iron building 200 × 110 ft., which will contain a 12-ton open hearth steel furnace and a 24-pot crucible furnace. It is expected that the plant will be in full operation by June 1, making general steel castings and material for the Ross-Meehan shoes.

Iron and Steel.

Riter & Conley, of Pittsburgh, have received a contract from F. B. Baird for all the iron work of a blast furnace to be erected at Buffalo, N. Y., on the site of the old Union Iron Works.

The Lackawanna Iron & Steel Co. is completing extensive improvements in the finishing depart ment of the Scranton Steel Co.

The Pittsburgh Tube Works, of Pittsburgh, which has been shut down for about five months, has resumed operations.

The Watts furnace at Middlesborough, Ky., will go into blast about July 1.

The Indiana Bridge Co., of Muncie, Ind., has a contract for furnishing 300,000 lbs. of building iron for an iron mill at Wheeling, W. Va.

The Sterling Steel Co., near McKeesport, Pa., is expending $65,000 on additional shops. There will be a hammer shop, machine shop and a warehouse, all to be finished by April 15. In the new shops steel projectiles will be made for the United States Government.

The new plant of the Anderson Rolling Mill Co., of Anderson, Ind., at Muncie, Ind., will be in operation in about a month, giving employment to 300 men.

The contract for the iron working tools for the shops of the Great Northern, at Great Falls, Mont., has been let to the Niles Tool Works, and for the wood working tools to the Berry & Orton Co., of Philadelphia.

New Shops and Stations.

The Schenectady Locomotive Works, of Schenectady, N. Y., have let a contract for a new foundry, 346 × 100 ft in size.

The Grand Trunk is to build a 50-stall roundhouse at Sarnia, Ont. The building is to be completed by July, and it is probable that another building will then be erected for workshops and offices.

The Central Railroad of Georgia will erect a new station at Americus, Ga., at a reported cost of about $15,000.

Electric Transmission of Power.

The electric power transmission plant between Lauffen and Heilbronn, in Germany, was given over to service on Jan. 16, the preliminary tests of transformers and cables having proved satisfactory. For the present, 330 H. P. are being transmitted, but this is shortly to be increased to 1,000 H. P. The distance between Lauffen and Heilbronn is 12 kilometers, or about 7½ miles. A turbine plant drives the dynamos, the former having been furnished by the Geislingen Machine Works, the latter and the transformers by the Oerlikon Machine Works, in Switzerland, and the cables by Siemens & Halske, of Berlin.

The Jull Snow Excavator.

One of these snowplows has been delivered to the West Shore Railroad for the purpose of testing. A press dispatch states that it has been sold for $18,000. This is an error; the regular price of the machine is $15,500, delivered at Paterson, and this individual machine has not been sold.

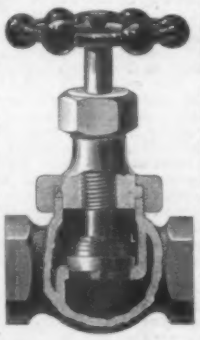
The presidents of the Tennessee Coal, Iron & Railroad Co. and the De Bardeleben Coal and Iron Co., of Alabama, have settled upon a basis of agreement for the consolidation of the two companies, which will soon be submitted to the stockholders for ratification. The capital stock of the De Bardeleben Co. is $10,000,000, the bonded debt $3,000,000. The capital of the Tennessee Coal and Iron Co. is $5,000,000 in bonds, $1,000,000 in preferred stock and $9,000,000 common stock. The capital stock of the new company will be $17,000,000 common stock, $1,000,000 preferred stock and $1,000,000 treasury stock. The daily output of these two companies is 1,700 tons of pig iron and 9,500 tons of coal. The Sloss Iron and Steel Co. which included in the preliminary negotiations was dropped from the final agreement.

Reduction of Smoke from Locomotives.

A short time since a conference was called at the office of the Commissioner of Health of Chicago to discuss with the railroad men the possibilities of reducing the smoke from locomotives. Mr. J. N. Barr, Superintendent of motive power of the Chicago, Milwaukee & St. Paul, stated before the conference that he had given much attention to this subject, and said: "The essential point to be observed is to supply sufficient air to the fire so that the carbon will be burned before it goes into the stack. A good hot fire must be kept up; if it is deadened, then smoke will be produced. Usually a dead fire results when the engine stands still or when fresh coal is put on. The smoke preventing device used on the St. Paul road introduces the air when the fire is deadened. The term 'smoke consumer' is false, as smoke cannot be consumed after it is once formed, but it can be prevented." Mr. R. D. Smith, Local Master Mechanic of the Chicago, Burlington & Quincy, agreed with all of Mr. Barr's remarks, and said the Burlington had used coke on their passenger cars while in the stations and changing to soft coal after leaving the stations. It was evident from the remarks of the engineers present at the conference that all the smoke consumers brought out so far require intelligent management in order to make them effective.

Lunkenheimer's Regriading Globe Valve.

We show a sectional view of a valve that has some features of special merit. Instead of the hub being threaded direct to the body of the valve, it is merely fitted into it plain, and rests upon a flange which fits upon the upper edge of the opening. The hub is then secured by a nut which fits over the flange, and is threaded to the outside of the body of the valve. The result of this arrangement is that the valve can be reground at any time with facility, because all that is necessary is to loosen the nut, remove the hub, place a little sand and soap under the disc, and then replace the hub, leaving the nut loose, so that the hub is free to turn with the stem during the grinding. A piece of wire is passed through a hole provided for that purpose in the lower end of the stem and disc, so that the disc will turn with the stem during the grinding, which, of course, it does not necessarily do when in use.



The hub being in place when the grinding is done, effectually centres the stem and holds it in proper place, so that the regrinding is done correctly. The valve can thus be readily ground while in position, and in many cases does away with the necessity for breaking connections. The disc is also, of course, easily replaced when required. These valves are made only by the Lunkenheimer Brass Manufacturing Co., Cincinnati, O.

The New Buffalo Shops of the New York Central.

Work will begin next month on the locomotive repair shops which the New York Central is to build at Lancaster (Grimesville station), about 10 miles from East Buffalo, N. Y. The buildings will consist of two erecting shops, 70 × 60 ft. each, with a capacity of 25 engines each. The blacksmith shop will be 80 × 252 ft., machine shop 80 × 360 ft., boiler room 36 × 80 ft., pattern shop and storeroom 50 × 144 ft., casting storage shed 50 × 150 ft., offices and storehouse 50 × 144 ft., boiler shop 90 × 300 ft., boiler iron shed and blacksmith shed 20 × 360 ft., transfer table 80 × 527 ft. Electric transfer tables will be put in, and 60-ton electric traveling cranes. The plans for the buildings are all ready and bids are now being taken. Officers of the company state that these buildings are to be put up at once. The shops will be large enough to employ 1,200 men. The work now undertaken will cost $600,000, but it is announced that the plant will be eventually enlarged and equipped with machinery for locomotive building. Title to about 100 acres has been purchased.

The Buffalo Investment Co., of which Charles A. Gould is President, has bought about 1,500 acres adjoining the Central's property and the whole property will be incorporated as the village of Depew. The Gould Coupler Co. proposes to locate works at the new village and other manufacturing establishments will probably remove to the new location.

The St. Paul & Duluth Shop at Gladstone.

At the general repair shops of the St. Paul & Duluth at Gladstone, Minn., about 160 men are now employed. The general repairs include the complete overhauling of an average of three engines each month. All freight engines passing through the shops have extension fronts applied and straight stacks substituted for those of the diamond type. Several sets of the Toucey, a square ring packing, have been applied to piston rods and valve stems and have given good service. It is the practice at these shops to place a strip of asphaltum paper between the plates of tender tanks, and when riveted a perfectly tight joint is obtained, without chipping or calking.

A Stow flexible shaft has recently been added to the equipment and is operated by means of a three cylinder air engine, designed by Master Mechanic Brooke and built at the shops. Mr. Brooke says he bores cylinders with a pressure of 6 lbs. The engine is mounted on a small truck and may be used in any part of the shops, air being supplied through the air brake testing pipes, from one pump in the tool room. A number of dies and formers have been added to the equipment of the blacksmith shop, which, like the other departments, has a full force of men employed.

Electricity for Tempering Steel.

According to one of the French papers, electricity is in successful use at the gun factory at St. Etienne for tempering gun springs. The latter consist of steel wire which is wound spirally, and a current of 45 volts and 23 ampères is passed through it. Rapid heating results and when the required temperature has been reached, the current is interrupted and the spring is let fall into a trough of water. One workman, it is stated, can temper 2,400 springs per day by this method.

Abating the Smoke Nuisance in Chicago.

The Society for the Prevention of Smoke, which was incorporated in Illinois recently, with headquarters in Chicago, has already commenced an active aggressive policy. Already a large number of cases have been pushed through the courts with fines varying from $25 to $50. Some of the largest companies, such as the City Railway, the Edison, and others, have been fined. The prosecution is being pushed regardless of political "pull." A considerable number of experiments are under way with various types of smoke preventers. These experiments are not confined to buildings, but include locomotives, tugs, and all other smoke-making apparatus used within the city limits. A steam tug operating in the river has been obtained for extended experiments with a number of different devices, and the Society for the Prevention of Smoke has called for the various inventors to bring forward their devices. The mechanical engineer of the society is making his investigations in a scientific way. One of the most important steps he has taken is to promulgate the proper theory of the steam jet devices as smoke preventers. He has stated publicly that the devices presented will be experimented with on the theory that the value of a steam jet lies in the fact that it forces air into the furnace, and not in a dissociation and recombination of hydrogen and oxygen in the steam.

Rust in Tunnels.

The rusting of rails in long tunnels is the subject of a recent article in the *Civil-Ingenieur*, describing the results of observations in the Altenburg tunnel, which is about 1,230 ft. long and located on a curve of 2,950 ft. radius. The rails had been down for 11 years, and at the end of that time were covered to a depth of 0.16 to 0.24 in. by hard scales, which could only be removed by a knife. They were composed mainly of iron sulphide and were found principally on the web. While the weight of the rail was much reduced in this manner, its sectional area was found to have increased, owing to the flaky character of the rust. The new rails have been covered with a mixture consisting largely of tar, which is renewed every six months. The gravel ballast has also received a partial covering of broken limestone, and by these means it is hoped that the formation of rust will be retarded. In the Brandleite tunnel in Thuringen it was found that rails and metal ties were destroyed by rust as fast as by the passing trains. The ties lost about 5.9 lbs. each in six years. This tunnel is nearly 10,000 ft. long, and is on a tangent having a 1 per cent. grade.

THE SCRAP HEAP.

Notes.

The Canadian Pacific has discharged a considerable number of freight train men on the division west of Winnipeg who were found to be inciting a strike.

A milk shed and a hay shed belonging to the New York, Lake Erie & Western road at Jersey City, N. J., were burned on the night of March 12, over 20,000 bales of hay being destroyed. The loss was about $100,000.

The abolition, by the Supreme Court, of the Ohio law, under which the railroads have paid a special tax of $1 a mile, leaves $28,000 in the hands of the State which will have to be repaid, the railroad companies having paid that amount under protest.

Governor Russell, of Massachusetts, has signed the bill prohibiting members of the legislature from receiving or using free railroad passes, and it has become a law. The members are granted $2 a mile for traveling expenses during the whole session, which generally lasts from three to five months.

A strike of workmen in the shops of the Pennsylvania Co. at Indianapolis, which began about the middle of February, has been a very persistent one, and the strikers have persuaded many new men to back out of their agreements. On Monday last the road secured an injunction restraining its late employés from interfering with its efforts to employ new men.

The conductors and trainmen of the Atchison, Topeka & Santa Fe have secured a readjustment of wages, under which certain passenger men will get an advance of $5 a month. Passenger trains east of the Missouri River are to have two brakemen each instead of one as heretofore. The objections of the men to the surety company which the company directed them to go to for

bonds have led to a change, and it is said that the men are hereafter to be bonded by the Fidelity and Casualty Company, of New York.

World's Fair Notes.

The Bethlehem Iron Co. will make an extensive exhibit, including steel rails, a battle ship shaft 125 ft. long, guns, projectiles, an armor plate ingot weighing 100 tons, a full sized model of its 125-ton steam hammer, which will span the main avenue of Machinery Hall. The top of this last exhibit will be 90 ft. above the ground.

The United States Treasury Department has decided that machinery imported to the exposition from foreign countries, either wholly as an exhibit or to be shown in connection with the illustration of some manufacturing process, shall be admitted free of duty. Any raw material imported for use in such process must pay regular duty.

The Japanese headquarters will be retained as a permanent building in Jackson Park. It will cost about $70,000, and will occupy about 40,000 sq. ft. of surface. The Mikado of Japan has given the construction to Chicago on the condition that it be kept in repair, and that one room in it be devoted to a public exhibit of Japanese works of art which the Japanese government agrees to replenish from time to time.

A bill protecting foreign exhibitors of patented articles from all possible prosecution for infringement has been passed by the United States Senate, and it is reported as sure to pass in the House. The bill reads as follows: "That no citizen of any country shall be held liable for the infringement of any patent granted by the United States or any trade mark registered in the United States where the act complained of is performed in connection with the exhibition of any article or thing at the World's Columbian Exposition at Chicago."

The contractors for the Manufacturers' Building will soon be ready to raise the immense trusses. There are 27 in all, with a span of 380 ft., and a height of 211 ft. They are 14 ft. wide at the floor and 10 at the apex. They are to be raised in position from the floor. To do this a traveler is being constructed 50 ft. × 200 ft. on the ground, and 120 ft. high. On the top of this traveler will be raised a central tower 135 ft. high, so that the total height will be 255 ft. This traveler will be moved on a track specially prepared for it.

Foreign Notes.

The City of Lyons, France, is to have an "Eiffel" tower, a company having been formed to build and operate it. It is to serve the purpose of a popular observatory and is to be furnished with suitable instruments. The price of admission is to be one franc. The contract for the metal works will, very probably, be given to the Eiffel establishment at Paris.

Though at the start a good deal of opposition was raised against the introduction of electric power for the street car lines at Budapest, it has now been definitely settled to use the electric system, and preparations having that end in view are to be made at once. The system will be partly underground and partly overhead, the underground arrangement to be used along the paved streets and the overhead in the further outlying districts where underground conduits would be inexpedient and very costly.

As a sample of what is now being done in Germany in the way of central station steam distribution for heating and power purposes, *Uhland's Wochenschrift* cites an experiment just being carried out at the city of Aachen of heating the dwelling houses and other buildings of a whole square by steam from one source. The steam in the station is first used for driving electric light engines, and is then exhausted into the heating mains, the general features of the plant being of a kind familiar to most American engineers.

The completion of the Siberian railroad will, it is thought, exert a most beneficial influence on the mining industries of the Ural districts in Russia. At Slatoust, for example, it is expected that the copper smelters will again resume operations, and thus afford opportunity for the reopening of the copper ore mines at Miask. The pig iron output of the Slatoust furnaces, also, will be increased, and similarly renewed activity will be infused into the mining districts of Ssimsk, Katowsk and Jurasan, where there are said to be large deposits of rich ores but only limited fuel supplies. In the train of these developments, it is predicted, will follow the establishment of various metal working industries, foundries, etc., which will help largely to supply the Russian market with steel and iron goods of all kinds.

Railroad accidents have become so frequent in France, and the results have in several instances been so disastious that the French Department of Public Works has felt itself called upon to take the matter in hand, and, if possible, to devise reasonably efficient preventive measures. One of the first results of its deliberations is a circular letter, recently sent to the various railroad companies, in which train detentions are pointed out as fruitful causes of accidents and largely responsible for the mishaps of recent occurrence. It is of vital importance to avoid the general irregularity in the running of trains, the missing of connections, etc., consequent upon such detentions, and the companies, accordingiv, are requested to give the subject careful consideration, to examine into the duration and adequacy of the different station stops and other like matters, with the view of bringing about generally improved conditions. Reports of the investigations and results are to be submitted to the department by the companies.

In addition to the Siberian railroad projects which the Russian government has, of late, been actively prosecuting, it now has under consideration also the building of a road to connect Persia with the Caucasian system. The starting point of the line is to be at Adjicabula, southwest of Baku, and the road itself is to pass through the plains of Mongan, touch Beliasonvar and Lenkoran, and reach the frontier at Astara. According to the preliminary surveys, made by the chief engineer of the government roads, M. Radzyg, there will be few difficulties of construction. The country to be crossed is nearly level, with little to be done in the way of cutting and filling. There will be a few water courses to cross, but, with one exception, they are small. The country is but sparsely inhabited, and the prospective traffic light. The end desired by Russia, however, is to reach Persia from the north, while England seeks to reach it from the south.

Spanish American Notes.

Mr. H. Hodgson, formerly consulting engineer to the Costa Rica Railway, has been appointed General Superintendent of that line.

A collision occurred on the Sao Francisco & Recife Railroad, in the state of Pernambuco, Brazil, on Feb. 23, in which 50 persons are reported to have been killed.

The traffic receipts of the Autofagasta & Bolivia Rail road for January, 1892, reached the handsome figure of $392,000, being an increase of $179,000 over the receipts for the same month of 1891.

The Costa Rica Railway has been obliged to increase its regular train service by four special trains to carry the extraordinary shipments of coffee from the interior plateau to the port of Limon.

Mr. Minor C. Keith has been granted an extension until June 30, 1893, for beginning the construction of the Northern Pacific Railway of Costa Rica. This line will run from Alajuela northward through the San Carlos district to Nicaragua.

The Lima and Oroya Railway, commonly known as the Central Railway of Peru, has been opened to traffic as far as Casapalca, and work has proceeded so well that the opening of the line to Oroya is now definitely promised to take place on June 1.

All the railroads in the state of Sao Paulo, Brazil, have for weeks been blocked with the excessive coffee crop, every available car being in service, freight depots and storage houses crowded, and further receipts of coffee for forwarding being declined for the present.

Construction is reported as being in progress upon the continuation of the Matagalpa & Rio Grande Railroad, Nicaragua. This road is now in operation from Corinto, on the Pacific coast, 52 miles inland, and when finished will reach Limos on tidewater on the Rio Grande. It passes through a rich coffee country.

One result of the large demand for agricultural implements last season in Argentine has been to stimulate an attempt to manufacture this class of machinery on the spot. Don Felipe Schwarz, of Buenos Ayres, has recently completed the first threshing machine ever made in South America, which will be followed by others in time for next year's harvest.

The Chilian government recently advertised for bids for 300 freight cars, 150 cattle cars, and 72 pairs of car wheels, for the state railroads. English journals confidently announced that the specifications for this rolling stock would not be furnished to American firms on account of the recent diplomatic controversy, and that the order would necessarily be placed in England. As a matter of fact these specifications were supplied to the agents of several firms in this country, and a telegraphic despatch from Chili announces that Brown, Beeche & Co., the Chilian branch of Hemenway & Brown, of Boston, have got the contract.

The transfer of the Rio Claro Railway, Sao Paulo, Brazil, from its present English owners to the Companhia Paulista do Estrada de Ferro de Oeste has been authorized by the government. The capital is to be increased to $21,870,000, but the claim to an exclusive terminus at Santos is not allowed. A double track is to be laid throughout the length of the line, the rates are to be lowered, and the road is hereafter to be subject to government supervision. The merchants of Sao Paulo have, however, protested against the sale of the Rio Claro, claiming that the present lower capital would enable the old company to reduce tariffs, and expressing fears of allowing the Paulista Company to become so powerful in the state of Sao Paulo. This company, which is a native Brazilian syndicate, built its original line, amounting to 151 miles in all, without the aid of foreign capital. It was economically built, and has been economically and profitably managed. It now aspires to acquire a virtual monopoly of all traffic from the interior of Sao Paulo to the coast, which it would obtain by the purchase of the Rio Claro. It has a strong rival, however, in the enterprising Mogyana Railroad, which will soon have an outlet to Santos.

Iron Notes.

Mr. Jeans, the Secretary of the British Iron Trade Association, reports the British make of pig iron for 1891 as 7,228,496 gross tons. The production in three principal iron making countries for the past ten years was as below, the United States and the United Kingdom in tons of 2,240 lbs., that of Germany (including Luxemburg), in tons of 2,204 lbs.

	United States.	United Kingdom.	Germany.
1882	4,623,323	8,493,287	3,380,805
1883	4,595,510	8,490,224	3,469,719
1884	4,097,868	7,528,935	3,600,612
1885	4,044,526	7,297,295	3,687,433
1886	5,683,329	6,870,695	3,528,658
1887	6,417,148	7,441,927	4,032,953
1888	6,489,738	7,898,634	4,337,121
1889	7,603,642	8,245,335	4,387,504
1890	9,202,703	7,875,130	4,637,239
1891	8,279,733	7,228,496	4,452,019

It is noticeable that during these 10 years of progress, the three chief iron producing countries have only increased their output by 21 per cent. The relative positions, however, of the three countries have changed greatly. In 1882 England was making over 51 per cent. of the aggregate, this country 28, and Germany 20 per cent. Last year this country made 41 per cent., the United Kingdom 36 and Germany 22 per cent.

No. 1 anthracite has lately touched $16, the lowest price on record; Bessemer pig is $14.75 at Pittsburgh and gray forge is wanting purchasers in Louisville at $9.50. In England on the 5th Scotch warrants were 41s. ($10) and hematite, Bessemer pig, was quoted at 46s. 1d., or $11.24.

The British production of Bessemer steel ingots for 1891 was 1,642,005 tons, of which 335,776 tons were basic, as against 2,014,843 tons in 1890, of which 402,113 tons were basic. This shows a decrease for 1891 of 372,838 tons. The production of Bessemer steel rails was 602,676 tons compared with 1,019,600 tons in 1890, a decrease of 356,930 tons, or 35 per cent., as compared with a reduction of 32 per cent. in the production of this country, which for 1891 was 1,219,874 gross tons. The production of open hearth steel in England was 1,514,438 tons, a decrease of 49,062 tons.

A New Swiss Mountain Railroad.

The latest mountain railroad project in Switzerland is that for a road to the summit of Mt. Eiger, the right of way for which has just been applied for by the engineers, E. Strub, of Berne, and Hans Stuber, of Interlaken. The starting point of the road is to be at Scheidegg, at an altitude of 2,064 metres (about 6,770 ft.) above sea level. The first section of the line is to be from Scheidegg to the foot of Mt. Rothstock, a distance of 1,900 metres (6,232 ft.), with a maximum grade of 25 per cent., and is to be worked on the rack system. The second section is to comprise practically two cable roads, one of them 1,100 metres (3,600 ft.), and the other 1,700 metres (5,576 ft.) long. Changes of train are to be made in reaching the summit of the mountain, which is 3,970 metres (about 13,021 ft.) above the level of the sea. Water and electric power are to be used in working the cable sections. The estimated cost is placed at 3,900,000 francs, or about $780,000.

Bridge Building in Texas.

A few days ago a man fell off the Southern Pacific Co.'s bridge over the Pecos River, and Judge Roy Bean, of Langtry, was called on to hold the inquest. He duly arrived on the ground accompanied by several Langtryites, and a score or more of bridgemen. On the body were found a Colt's 45, all barrels loaded, and about $40 in lawful money of the United States. "Gentlemen," said his honor to the by-standers, "there is nothins to find out, about how that man came to his death. He fell from the bridge, that's all there is about it. But there is one thing that is not so plain, and that is what was he doing with that gun? Of course he is dead and cannot explain; but that ain't the fault of the law, it is his own misfortune. Justice is justice, and law is law, and as he can't offer no satisfactory explanation of the matter, I shall be obliged to fine him $40 for carrying on or about his person, that pistol. Because a man chooses to don his wings and skim off to the skies, is no reason that the great state of Texas should not have what is coming to her all the same."

The Ontario Ship Railroad.

Messrs. David H. H. Cook, John C. Fitch, Hugh Blain, Joseph Plakerly, all of Toronto; E. L. Corthell, of Chicago, and William Ball, of Sault Ste. Marie, are applying to the Ontario Legislature for an act of incorporation for the purpose of constructing a ship railroad from a point on Lake Ontario to Georgian Bay.

LOCOMOTIVE BUILDING.

The Minneapolis & St. Louis is in the market for two engines for passenger service.

The Central of New Jersey has ordered from the Baldwin Locomotive Works four compound locomotives to be duplicates of No. 385, which recently made a record of 91.7 miles an hour.

The compound locomotive built by the Brooks Locomotive Works for the Lake Shore & Michigan Southern is now in regular freight service between Buffalo and Cleveland. The work done by the engine is very satisfactory, and it is understood that more of the same type will be built.

Within the last week the Baldwin Locomotive Works have booked the following among other orders: Central Railroad of Brazil (metre extension), six compounds. This follows an order for 17 sent out last summer. Western Railroad of Cuba, one compound; Missouri Pacific, 30 ten-wheelers, simple; Grand Rapids & Indiana, 16 consolidations and seven passenger engines, all simple; Missouri, Kansas & Texas, six moguls, one of which is a compound; Southwestern Company, nine moguls, simple; Chicago, Rock Island & Pacific, five passenger 10-wheelers, simple; Chicago Street Railway, two compound motors.

CAR BUILDING.

The Duluth & Iron Range has placed an order with the Wells-French Car Co. for 125 ore cars.

The Duluth, Me sabe & Northern will order 300 ore cars and four engines for delivery in July.

The Southern & Southern Pacific Refrigerator Co. is building 100 patent refrigerator cars for the Schoenfoefen Brewing Co.

An order has been given by the Northern Pacific to build 100 of the Street stable cars at its new shops at Edison, near Tacoma, Wash.

The Erie Car Works has begun the delivery of 500 cars which it is building for the Pennsylvania. The first 300 built have been ordered for the Philadelphia & Erie Division.

The Buffalo Car Mfg. Co. is working on a large order for box cars for the West Shore, which are being equipped with the Gould car coupler and the Westinghouse air brake.

The Missouri, Kansas & Texas has recently placed an order with the St. Charles Car Co. for five handsome chair cars, 60 ft. long, 6 wheel trucks, mahogany finish, and to be equipped with latest devices.

The St. Charles Car Co. has just delivered 10 elegant first class passenger cars for the Burlington & Missouri River Railroad. These cars are mahogany finish and equipped with Scarritt high back seats.

BRIDGE BUILDING.

Baltimore, Md.—The City Council has approved plans for the construction of the stone bridge at North avenue, in Baltimore. The cost is estimated at $341,000 for the structure, and about $100,000 additional for approaches will be paid for by the Baltimore Belt Railroad. The bridge will be about 440 ft. long and 100 ft. wide, and will be lined with brick. The plans were prepared by F. H. Smith, City Engineer. Bids were received for this bridge a year or so ago, but the lowest bid then was about $100,000 in excess of the appropriation.

Beauharnois, Que.—The Dominion Government is calling for tenders for the construction of two bridges across the River St. Louis, in the County of Beauharnois, Quebec, according to plans and specifications to be seen at the office of Alexander Doutre, Beauharhnois, and at the Department of Public Works, Ottawa.

Chester, Pa.—The Delaware County Commissioners have accepted the plans for the new bridge over Fourth street, in Chester, and work will be commenced on the structure as soon as the weather will permit.

Everett, Wash.—The Washington Bridge Co., of Tacoma, has received a contract to build an iron bridge across the Snohomish River from Swalwell's landing at Everett. The bridge will cost $10,500.

Frankfort, Ky.—The City Council has advertised for bids for building a new bridge between North and South Frankfort, to replace a wooden bridge which was built in 1847. The bridge is to be completed by September, and will cost about $60,000.

Germantown, O.—The bill authorizing the County Commissioners to expend $20,000 for building a bridge over the Great Miami River below Germantown, has been passed by the Senate and is now a law.

Hennepin, Ill.—The Hennepin Bridge Co. has been organized to build a bridge across the Illinois River at Hennepin, at a cost of about $25,000. William H. Casson is the President of the company.

Macon, Ga.—Plans have been completed by the Central of Georgia for a new iron bridge to be built across its tracks on Fourth Street in Macon, and the contract for the work will be let as soon as bids can be taken.

Memphis, Tenn.—City Engineer Meriweather has been authorized to ask for bids for constructing a bridge over the bayou on Second street, under the plans prepared by him. The bridge will be of steel, with a 100 ft. span 26 ft. wide, and with 6 ft. sidewalks, the estimated cost being from $6,000 to $7,000.

New York City.—The Park Commissioners have awarded to the Passaic Rolling Mill Co. the contract for the construction of the drawbridge over the Harlem River at One Hundred and Fifty-fifth street, New York City, together with the spans included in the Jerome avenue approach. Six bids were received, as follows:

Passaic Rolling Mill Co., Paterson, N. J.	$1,102,535
Union Bridge Co., New York	1,150,452
Arthur McMillan	1,162,572
King Bridge Co., Cleveland, O	1,176,631
Anderson & Barr and Phœnix Bridge Works	1,186,873
T. & A. Walsh	1,202,0.4

The bridge was designed by A. P. Boller, of New York, and the general dimensions of the bridge have been heretofore given.

A bill has been introduced in the New York Legislature to authorize the construction of an East River bridge to be built in the interest of the Long Island Railroad. The company is to be called the New York & Long Island Terminal Railroad Company. The bridge is to be built from Long Island City to the vicinity of East Forty-third street. President Corbin says that the object of the measure is to get the Long Island Railroad into New York City, and it has nothing to do with any steamship scheme. Other roads may join in its construction, but for the present the Long Island is the only railroad interested. The bridge is to be exclusively a railroad bridge, no provision being made in the plans for carriage or foot ways. There will be four tracks and possibly six. The eastern approach will begin at Laurel Hill, near Newtown, and from there the ascent will be gradual until the pier level is reached at Long Island City. There will be two heavy granite piers placed midway in the East River, south of Blackwell's Island, to support the central spans. The three river spans will be each 1,000 ft. long. The structure will be built on the cantilever principle. It will be 135 ft. above high water and will be 12,450 ft. long, including the approaches. It is expected that it will take two years to build the bridge and that it will cost something over $10,000,000. The project includes the erection of a railroad station in New York city in the vicinity of Forty-second street.

Governor Flower last week signed the amended bills for the new bridges over the East River between New York and Brooklyn, projected in the interest of the Brooklyn Union Elevated Railroad. These bridges are to be built by the East River Bridge Co., which also has authority to build an elevated railroad across the city to the Hudson River. One bridge will be built to span the East River from Broadway, Williamsburg, to a point between Delancey and Rivington streets, in New York, and from there extend across private property to a point at or near Sheriff street, where the wagonway and entrance for pedestrians will be located. The second bridge which the charter authorizes, but which is not likely to be built, is to cross the East River from Hudson avenue, Brooklyn, to a point between Jackson and Scammel streets, in this city, thence extending northwesterly across private property to a point of junction with the first bridge at about Pitt street. The incorporators are George Hoadly, Frederick Uhlmann, Adolph Ladenburg, of Ladenburg, Thallmann & Co., and George Wingate. About $7,000,000 of the stock is reported to have been subscribed.

Portland, Or.—Engineer W. B. Chase, of the bridge committee of Portland, has completed the survey for the proposed free bridge across the Willamette River at Burnside street and is at work on the survey for the bridge at Albina, Or. He will soon send the maps to the war department.

Rosendale, N. Y.—The West Shore Railroad has completed surveys for a new bridge over Rondout Creek on the Wallkill Valley Railroad, to replace the present structure, which is built on a curve.

St. Paul, Minn.—The Chicago, St. Paul, Minneapolis & Omaha will replace the wooden highway bridge across its right of way on Payne avenue, with one of iron. It will be of plate girder construction, 185 ft. in length and is to be completed this year.

San Francisco, Cal.—The contract for building the bridge over the Gualala River has been let to Doe, Hunt & Co., of San Francisco, for $13,469. The bridge will be a combination truss with a 320-ft. span, and is to be completed by July.

Sioux City, Ia.—A highway bridge over the tracks of the Chicago, St. Paul, Minneapolis & Omaha and Illinois Central, on Fourth street, will be built jointly by the city and the two railroads. The superstructure will be of iron, plate girders and 246 ft. in length. It will carry a roadway 40 ft. wide and two sidewalks 10 ft. each. Plans are now being prepared.

Toledo, O.—The City Council has adopted plans prepared by the City Engineer for a wagon and foot bridge over Swans Creek at Perry street. The bridge will be about 160 ft. long, with a wagon road 32 ft. wide and two foot walks each 6 ft. wide. The estimated cost is $80,000 and it will be necessary to apply to the General Assembly for authority to issue bridge bonds for that amount.

Topeka, Kan.—The County Commissioners have accepted the plan prepared by W. Hildebrand, Consulting Engineer, of New York, for the proposed Quincy Street bridge. The Commissioners rejected all bids for the construction of the bridge under the old plan, and have advertised for new bids under the present specifications.

Vicksburg, Miss.—The Columbus Bridge Co. has been awarded a contract for an iron drawbridge over the Big Black River, in Warren County, near Vicksburg. The bridge will be 470 ft. long and will cost $14,642. The Commissioners propose to build other drawbridges over the same stream if the adjoining counties will share part of the expense.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Chicago, Milwaukee & St. Paul, annual, 3½ per cent. on the preferred stock, payable April 19.

Cleveland, Cincinnati, Chicago & St. Louis, quarterly, 1¼ per cent. on the preferred stock, payable April 1.

New London Northern, quarterly 2 per cent., payable April 2.

Oregon Railway & Navigation Co., quarterly, 1½ per cent., payable April 1.

Philadelphia, Germantown & Norristown, quarterly, 3 per cent., payable March 15.

Providence & Worcester, quarterly, 2½ per cent., payable March 31.

Sunbury & Lewistown, semi-annual, 4 per cent., payable April 1.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Chicago & Alton, annual, Chicago, Ill., April 4.

Herkimer, Newport & Poland, special New York, N. Y., April 4.

Herkimer, Newport & Poland Extension, special, New York, N. Y., April 4.

Joliet & Chicago, annual, Chicago, Ill., April 4.

Long Island, annual, Jamaica, N. Y., April 12.

Mexican National, New York, N. Y., March 23.

New York Central & Hudson River, annual, New York, N. Y., April 20.

New York, Ontario & Western, New York, N. Y., April 20.

New York & Rockaway Beach, annual, New York, N. Y., March 22.

Pittsburgh, Cincinnati, Chicago & St. Louis, annual, Pittsburgh, Pa., April 12.

Panama, annual, New York, N. Y., April 4.

St. Lawrence & Adirondack, special, New York, N. Y., April 4.

Southern Central, special, Philadelphia, Pa., April 12.

Traverse City, annual, Travers City, Mich., May 5.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *New England Railroad Club* holds regular meetings, at the United State Hotel, Beach street, Boston, Mass., on the second Monday of each alternate month commencing January.

The *Western Railway Club* holds regular meetings on the third Tuesday in each month, except June, July and August, at the rooms of the Central Traffic Association in the Rookery Building, Chicago, at 2 p. m.

The *New York Railroad Club* holds regular meetings on the third Thursday in each month, at the rooms of the American Society of Mechanical Engineers, 12 West Thirty-first street, New York City, N. Y.

The *Southern Railway Club* holds regular meetings on the third Thursday of the months of January, February, March, May, September and November at such points as are selected at each meeting.

The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, the fourth Wednesday of January, March, May, September and November.

The *Northwest Railroad Club* meets on the first Saturday of each month, except June, July and August, in the St. Paul Union Station, at 7:30 p. m.

The *Northwestern Track and Bridge Association* meets on the Friday following the second Wednesday of March, June, September and December, at 2:30 p. m. in the directors' room of the St. Paul Union Station.

The *American Society of Civil Engineers* holds its regular meetings on the first and third Wednesday in each month, at the House of the Society, 127 East Twenty-third street, New York.

The *Boston Society of Civil Engineers* holds its regular meetings at the American House, Boston, at 7:30 p. m., on the third Wednesday in each month.

The *Western Society of Engineers* holds its regular meetings at 78 La Salle street, Chicago, at 8 p. m., on the first Wednesday in each month.

The *Engineers' Club of St. Louis* holds regular meetings in the club's room, Laclede Building, corner Fourth and Olive streets, St. Louis, on the first and third Wednesday in each month.

The *Engineers' Club of Philadelphia* holds regular meetings at the House of the Club, 1,122 Girard street, Philadelphia, on the first and third Saturday of each month. The annual meeting is held on the third Saturday in January. The club stands adjourned during the months of July, August and September.

The *Engineers' Society of Western Pennsylvania* holds regular meetings on the third Tuesday in each month, at 7:30 p. m., at its rooms in the Thaw Mansion, Fifth street, Pittsburgh, Pa.

The *Engineers' Club of Cincinnati* holds its regular meetings at 8 p. m. on the third Thursday of each month in the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati.

The *Civil Engineers' Club of Cleveland* holds regular meetings on the second Tuesday of each month, at 8 p. m., in the Case Library Building, Cleveland. Semi-monthly meetings are held on the fourth Tuesday of the month.

The *Engineers' Club of Kansas City* meets in Room 200, Baird Building, Kansas City, Mo., on the second Monday in each month.

The *Engineering Association of the South* holds its monthly meetings on the second Thursday at 8 p. m. The Association headquarters are at Nos. 63 and 64 Baxter Court, Nashville, Tenn.

The *Denver Society of Civil Engineers and Architects* holds regular meetings at 36 Jacobson Block, Denver, Col., on the second and fourth Tuesday of each month, at 8 o'clock p. m., except during June, July and August, when they are held on the second Tuesday only.

The *Civil Engineers' Society of St. Paul* meets at St. Paul, Minn., on the first Monday in each month.

The *Montana Society of Civil Engineers* meets at Helena, Mont., at 7:30 p. m., on the third Saturday in each month.

The *Civil Engineers' Association of Kansas* holds regular meetings at Wichita on the second Wednesday of each month at 7:30 p. m.

The *American Society of Swedish Engineers* holds meetings at the club house, 250 Union street, Brooklyn, N. Y., and at 347 North Ninth street, Philadelphia, on the first Saturday of each month.

The *Engineers' Club of Minneapolis* meets the first Thursday of each month in the Public Library Building, Minneapolis, Minn.

The *Canadian Society of Civil Engineers* holds regular meetings at its rooms, 112 Mansfield street, Montreal, P. Que., every alternate Thursday except during the months of June, July, August and September.

The *Association of Civil Engineers of Dallas* meets at 803 Commerce street, Dallas, Tex., on the first Friday of each month at 4 o'clock p. m.

The *Technical Society of the Pacific Coast* holds regular meetings at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., at 8 o'clock p. m. on the first Friday of each month.

The Tacoma Society of Civil Engineers and Architects holds regular meetings on the third Friday of each month, in its rooms, 201 and 202 Washington Building, Tacoma, Wash.

The *Engineers and Architects' Club of Louisville* holds regular meetings on the second Thursday of each month, at 8 o'clock p. m., at its rooms in the Norton Building, Louisville, Ky.

Central Railway Club.

A regular meeting of this club will be held at the Hotel Iroquois Wednesday morning, March 23. The subjects for discussion are: "A uniform charge for repairs to cars under rules 6 and 8, sections B and C," and "steel trucks for freight cars."

Civil Engineering Society of St. Paul.

Mr. C. C. Hollinsworth read a paper on the Yellowstone Park at the last regular meeting of the society, held at St. Paul, March 7. At that meeting H. S. Crocker, John Blodgett and David Curtin were elected members.

Engineers' Club of St. Louis.

The club met at 8 p. m. at the club rooms, March 1, President Johnson in the chair, and 23 members and two visitors present. Messrs. A. S. Cushman, A. H. Baldwin and Morris Wuerpel were elected members of the club.

The secretary read a communication from Mr. O. Chanute, inviting the members of the club to attend and take part in the International Congress for Internal Navigation, at Paris, France, in July.

Mr. J. A. Laird described the character of the cast iron used in the Worthington engines at the St. Louis waterworks. Discussion followed by Messrs. Ferguson, Blaisdell, Seddon, Johnson, Crosby, Laird, Thacher, Gaylor and Hermann. Adjourned.

New England Railroad Club.

The annual meeting of the club was held on Wednesday evening, March 9, President Twombly in the chair. Mr. F. M. Curtis, Secretary and Treasurer, read his report for the year, which showed a balance on hand at the beginning of the year of $88, collections, $374, and expenditures, $308, leaving a balance on hand of $156. There are 192 members and the average attendance at the meetings during the year has been 50.

Mr. Richardson, from the committee to nominate officers for the ensuing year, reported the following: For President, Fred. M. Twombly; Vice-President, John T. Chamberlain; Secretary and Treasurer, F. M. Curtis; Executive Committee, J. N. Lauder, F. D. Adams, J. W. Marden, A. W. Twombly, George Richardson, John T. Chamberlain, John Coughlan, E. E. Davis, L. M. Butler; Finance Committee, A. G. Barber, George B. Swett, Daniel S. Page, George H. Wightman, Osgood Bradley, John Kent, Joel Hills, Henry L. Leach, being the same officers who have served during the past year.

On motion of Mr. Adams it was voted that the Secretary be authorized to cast one ballot for the candidates reported. The Secretary cast the ballot accordingly, and the President announced the persons indicated as duly elected officers for the ensuing year.

The subject for discussion at the May meeting was announced as "Rule Eight of the Code of Rules of the Master Car Builders' Association, and other rules that may be suggested at the time;" and the subject for discussion at this meeting was Freight Car Trucks. A paper was to have been presented by Mr. John T. Chamberlain, but he was not present, and Mr. F. D. Adams was called upon to open the discussion. This discussion will be found in another column.

Northwestern Track and Bridge Association.

At a meeting of the Association held in the Union depot, St. Paul, March 11, the following officers were elected for the ensuing year: President, John McMillan; First Vice-President, W. S. Darby; Second Vice-President, H. A. Buel; Secretary, James McCutcheon, and Treasurer, J. Copeland. The subjects for discussion were continued to the next meeting, owing to the small attendance on account of the blizzard. The Treasurer's report showed a balance of $121. During the year there has been an increase in membership of 13 and the Association is now in excellent condition.

The Civil Engineers' Club of Cleveland.

The Twelfth Annual Meeting was held at the Club Rooms on Tuesday evening, March 8, with President Gobeille in the chair and 34 members and visitors present.

A communication from Mr. O. Chanute regarding the Fifth International Convention for Internal Navigation to be held at Paris in 1892 was laid before the club.

The annual reports of the retiring officers were presented. The Secretary's report showed that the net increase in membership during the past year was 11, that the attendance at the meeting was much larger than in any previous year, that regular meetings had been held every month during the year except August, and that 14 papers were read at the meetings.

The treasurer's report showed the finances of the club to be in excellent condition.

The librarian's report showed that the club's library is constantly increasing by the addition of valuable books of reference, that arrangements have been made with the Case Library Association by which members of the club may take from the library valuable reference books—a privilege accorded to no other class of members—that this library has the best selections of technical books of any library in the State, that the most valuable and costly reference books will be purchased and placed on the shelves at the request of members of the club, and that it is proposed to fit up a large room for the use of the club in the new library building which will be erected this year.

Three short but interesting reports were read by members of the programme committee, one by Prof. C. S. Howe on "Recent Advancement in Physics," one by Mr. Aug. Mordecai on "Railroad Engineering," and one by Mr. F. A. Coburn on "Recent Works of Architecture."

The tellers reported that the following officers had been elected for the ensuing year: *President*, Walter P. Rice; *Vice-President*, Albert H. Porter; *Secretary*, Charles S. Howe; *Treasurer*, Cyrus P. Leland; *Librarian*, Charles H. Benjamin; *First Director*, Charles H. Strong; *Second Director*, Gustavus A. Hyde.

A vote of thanks was extended to the retiring officers.

The annual address was then delivered by the retiring President, Mr. Jos. Leon Gobeille, entitled "The Financial Status of the Engineer."

The Engineers' Club of Philadelphia.

A meeting was held March 5, 1892, President James Christie in the chair, 55 members and five visitors present.

A memorial of Mr. Edward Nichols was presented and ordered to be printed in the minutes.

COST OF POWER.

Mr. Barton H. Coffey presented a paper on the "Cost

of Producing Power in the Internal Combustion Engine." The basis used is the cost per horse power hour. We must determine the absolute defficiency to calculate the heat required for given I.H.P., and, knowing the value of this, the cost of fuel is fixed. The remaining charges will be for attendance, maintenance, depreciation and interest on the investment. The absolute efficiency depends principally on the cycle employed and the diameter of the cylinder. As the cycle known as the Otto is the one in most extensive use to-day, I find that the absolute efficiency can be expressed quite accurately in the form $E = .61 \sqrt{\text{cylinder diameter}}$.

The steam engine is of course the principal rival of the engine treated of in this paper, and it is questionable if the combined efficiency of the best types ever rises above 12 per cent. From this figure as a maximum it ranges all the way down to 1 per cent., depending on the completeness of the steam system and the quality of the design and workmanship. The report of a test of a 170-H. P. Crossley gas engine, using producer gas, shows a consumption of but .85 lb. of coal per horse power hour, or an absolute combined efficiency of 21.3 per cent. for the engine and producer. The efficiency of the engine alone is in the neighborhood of 25 per cent. The three chief losses, incomplete expansion, conduction to the jacket, and sensible heat of exhaust, are all within the engineer's possible control. The almost prohibitive price at which this machine has hitherto been held will be reduced, and a more general introduction will follow.

ELECTRICAL TRANSMISSION OF POWER.

Mr. Carl Hering gave some items of the cost of the transmission of power from Niagara Falls to Buffalo. The units intended to be used are 5,000 H. P. The dynamos are to be coupled directly to the turbine by vertical shafts. Six hundred to 700 volts at the dynamo is to be transformed to 25,000 volts on the line. Three-phase dynamos are to be used, making 250 revolutions and supplying 2,000 ampères. The cost of the whole plant per unit of 5,000 H. P. is to be $180,000, or $36 per horse power. This estimate includes generator, line and transformers at each end, line cost alone being $20,000. At present the cost of dynamos varies from $50 to $75 per horse power. The total efficiency of the plant is to be 84 per cent. from the shaft of the turbine to the secondary terminals at Buffalo, the dynamo alone giving an efficiency of 96 per cent.

Mr. J. Bogart, Engineer of the Construction Company, stated that the Oerlikon Company's bid is about as Mr. Hering has given it.

PERSONAL.

—Mr. Waldo Adams, Manager of the Adams Express Co., died at Boston, March 9.

—Gen. Dudley S. Steele, one of the proprietors of the Jersey City Car Wheel Works, died last week at East Orange, N. J.

—Mr. J. L. Greatsinger has been appointed General Manager of the Duluth & Iron Range. Mr. Greatsinger has occupied with this road successively the positions of Master Mechanic and General Superintendent.

—Mr. R. E. Parsons, General Freight Agent of the Kentucky & Indiana Bridge Co., has resigned to take a position with the Pennsylvania. He only recently left the Ohio & Mississippi to go with the Bridge Co.

—Mr. George F. Evans, formerly General Manager of the Louisville, Evansville & St. Louis Railroad, has been formally appointed Superintendent of the southern district of the Boston & Maine, to succeed Mr. D. W. Sanborn, promoted to be General Superintendent.

—Mr. W. E. Rogers, lately Chairman of the New York State Railroad Commissioners, announces that he has opened a law office at 120 Broadway, New York. He is prepared to take legal business, particularly in connection with railroads, and to examine and report upon the the financial or physical condition of railroads.

—Mr. J. W. Lattig, formerly Superintendent of Telegraph of the Lehigh Valley, and more recently General Superintendent of the National Switch and Signal Company, of Easton, Pa., has accepted the position of General Superintendent of the Electric Secret Service Co. of New York, with special charge of its telegraph and signal department.

—Mr. Charles Howard has resigned his position as General Manager of the New York & New England, but it is not announced that his resignatation has been accepted. Mr. Howard became General Manager of the New York & New England in December, 1889. He had previously been Division Superintendent of the New York, Providence & Boston.

—Mr. Porter King, of Springfield, Mass., a locomotive engineer of the Boston & Albany since 1844 (48 years), has lately resigned. Mr. King ran a locomotive several years before the date mentioned, and ran trains on the line of the New Jersey Railroad and Transportation Company when the cars where drawn by horses. He ran an engine 47 years before running over or injuring any person.

—Mr. A. B. Priest, a veteran locomotive engineer of the Michigan Central, is the subject of an interesting sketch in the Detroit *Free Press*. Mr. Priest has been a runner 47 years, and has served 46 years on the Michigan Central. He has been retired on partial pay on account of blindness. He has never been censured or suspended; never saw a passenger hurt, and never had an accident whereby a passenger or trainman was hurt. Mr. Priest is a brother of Zenas C. Priest, late Division Superintendent on the New York Central.

—President Oakes, of the Northern Pacific and a party of railroad officers, were concerned in an accident at Nork Yakima, Wash., last Monday, which came near being fatal to several of the party. A wagon in which they were fording a stream was overturned by the current. Mr. Oakes succeeded in reaching a shallow point, Mr. Mellen was able to swim to the shore, but Mr. E. V. Smalley, editor of the *Northwest Magazine*, was rescued only after sinking twice.

—Hon. Judson C. Clements, of Georgia, has been nominated to be an Interstate Commerce Commissioner, vice Walter L. Bragg, dead, and William Lindsay, declined. Mr. Clements was born in Walker County, Ga., on Feb. 12, 1846, studied law at Cumberland University, Lebanon, Tenn., and in 1869 was admitted to the bar. He was elected to the Georgia Assembly in 1872 and 1874, and in 1877 he was elected to the State Senate. He was five times elected to Congress, as a Democrat.

—Hon. A. C. Chapin, of Brooklyn, has been appointed Railroad Commissioner of New York, to succeed Mr. Isaac V. Baker. Mr. Chapin is a member of Congress from Brooklyn, having been elected last fall. He was twice Mayor of that city, and has served several terms in the legislature, having been Speaker of the House for one term. Mr. Chapin is understood to be interested in several Western railroads, and is Secretary and Treasurer of the Spokane Falls & Northern road. He is a lawyer of ability and was formerly of counsel for the Long Island road.

—Hon. John F. Winslow, once a prominent iron and steel manufacturerer at Troy, N. Y., and one of the pioneers in the introduction into this country of the Bessemer steel industry, died at Poughkeepsie, March 10, at an advanced age. Mr. Winslow's firm contracted with the United States Government for the construction of Ericsson's "Monitor." He was President of the Rensselaer Polytechnic Institute at Troy between 1863 and 1867, and was also at one time President of the Poughkeepsie & Eastern Railroad, and of the company which constructed the Poughkeepsie Bridge over the Hudson River.

—Mr. W. E. Keefers, Assistant General Freight Agent of the Illinois Central, was appointed General Freight Agent of the northern and western lines this week, to succeed Mr. Horace Tucker. Mr. Tucker published a correspondence in the Chicago daily papers between himself and other officers of the company, from which it appears that President Fish wrote to Mr. Tucker in the latter part of February to the effect that his resignation as General Freight Agent would be called for in a few weeks. Mr. Tucker replied that as he had been in the service of the company for 30 years he would decline to offer his resignation, but asked for a formal letter of dismissal.

—Mr. John H. Inman, who has for four years been President of the Richmond Terminal system, resigned that office last Wednesday and Mr. Walter G. Oakman, who was Vice-President of the Richmond & Danville before he accepted a similar office with the Central of New Jersey, was elected President. Mr. Inman states that he tried to induce Mr. Oakman to accept the presidency of the company last November, but he had declined it at that time. Last week he again urged Mr. Oakman to take the place, who, he says, knows the Richmond & Danville thoroughly, having been its First Vice-President for several years. Mr. Oakman is about 45 years of age. He began his railroad career in the Rogers Locomotive Works. Subsequently he became Division Superintendent of the Delaware, Lackawanna & Western. Soon afterward he became Secretary and Treasurer of the Richmond Terminal Co., a place which he held until he went into the brokerage business in New York with the firm of Smith, Oakman & Ryan. He retired from that firm to accept the First Vice-Presidency of the Richmond & Danville, and last spring he was made First Vice-President of the Central of New Jersey road.

ELECTIONS AND APPOINTMENTS.

Aberdeen & Victoria.—The incorporators of this company are: J. M. Weatherwax, Samuel Benn, A. J. West, Eugene France, W. P. Book, C. T. Wooding, C. E. Perkins, E. W. Cummings, John O. Lewis, Sanford Shumacher, Alexander Young, Arthur T. Dabney and M. J. Cochrane. They are nearly all local business men of Aberdeen, Wash.

Alabama Midland.—The stockholders held their annual meeting in Montgomery, Ala., last week; and the following board of directors was elected: H. B. Plant, M. F. Plant, H. M. Flagler, H. S. Haines, M. J. O'Brien, W. F. Vandiver, O. C. Wiley, Henry Sanford and Major Carroll. The only change was the election of Messrs. Sanford, of New York; O. C. Wiley, of Troy; and Major Carroll, of Ozark, Ala., to succeed Messrs. Woolfolk, Shellhoun and Tallman. The directors elected H. B. Plant, President; M. F. Plant, Vice-President; R. B. Smith, of New York, Secretary; J. M. Lee, Treasurer, and B. Dunham, General Superintendent.

Allegany & Kinzua.—The annual election resulted in the choice of S. S. Bullis, J. C. French, M. W. Barse, C. D. Clarke, G. C. Farnsworth, C. D. Williams, C. G. Freck, F. E. Brooks, J. R. Droney, W. I. Bartholomew, G. C. Palmer, E. V. Dunlevie and F. L. Stowell as directors. They elected the following officers: President, S. S. Bullis; Vice-President, M. W. Barse; Secretary and Treasurer, J. E. Rooney; C. V. Merrick was reappointed Superintendent.

Atlanta & Charlotte.—At a general meeting of the stockholders and holders of the first mortgage bonds of the company at 48 Wall street, New York, the following directors were elected: Eugene Kelly, P. P. Dickinson, C. M. Fay, C. S. Fairchild, B. R. McAlpine, Richard Irvin, R. H. Rochester, H. W. Sibley, Skipwith Wilmer, Michael Jenkins, Joseph Bryan and D. J. Garth. Officers were chosen as follows: President, Eugene Kelly; Secretary, W. N. Wilmer, and Treasurer, George Sherman.

Barclay.—The board of directors of the Barclay Railroad & Coal Co. have elected Anthony Taylor Secretary and Treasurer, and Clarence R. Claghorn a director in place of William B. Thomas, deceased.

Chattanooga Southern.—P. L. Dudley, who has been General Freight Agent, has been appointed General Passenger Agent also, to succeed B. J. Robertson, who recently resigned.

Chicago & Eastern Illinois.—W. H. Lyford has been appointed General Counsel for the company, which is a new office. W. J. Calhoun, attorney in Danville, Ill., has been appointed General Attorney, with duties similar to those formerly performed by Mr. Lyford as General Solicitor.

Cincinnati, Hamilton & Dayton.—The stockholders of the company held their annual meeting at Cincinnati, March 15, for the election of three directors. W. M. Ramsey, of Cincinnati, was chosen to fill a vacancy that has existed for some time. George W. Davis, of Toledo, and E. S. Cole, of Marysville, O., were re-elected. The board of directors re-elected the present officers: President, M. D. Woodford; Vice-President, Eugene Zimmerman; and Secretary and Treasurer, F. H. Short.

Cincinnati, Jackson & Mackinaw.—The following directors have been elected for the reorganized company: Walston H. Brown, J. Kennedy Tod, R. T. Wilson, New York; F. B. Swayne, N. H. Swayne, F. B. Drake and B. A. Hayes, Toledo. The officers elected are: President, W. H. Brown; Vice-President, F. B. Swayne; General Manager, F. B. Drake; Secretary and Treasurer, W. Outwater.

Duluth & Iron Range.—J. L. Greatsinger has been appointed General Manager, vice M. J. Carpenter, elected President of this and the Chicago & Eastern Illinois roads.

Eastern of Minnesota.—W. H. Whyte has been appointed Master Mechanic vice E. B. Andrews.

East Tennessee, Virginia & Georgia.—A special meeting of the directors was held in New York March 15, at which the directors received the resignation of General Charles M. McGhee, and elected Walter G. Oakman in his place as a director. General Samuel Thomas resigned as chairman of the board of directors, and Mr. Oakman was chosen his successor,

Elizabeth & Pasquotank.—A. H. Lindsay, Joseph A. Wallace, H. F. Edmonds and others, of Norfolk County Charles H. Robinson, J. B. Flora and others, of Elizabeth City, N. C., are named as the incorporators in the Virginia charter.

Georgia.—A. G. Jackson has been appointed General Freight and Passenger Agent of the road. He is the agent of the Western & Atlantic road.

Great Northern.—Frank Bruce has been appointed Division Master Mechanic at Barnesville, Minn.

Illinois Central.—W. E. Keefers has been appointed General Freight Agent with office in Chicago, and W. R. Bascom, Assistant General Freight Agent, with office at Chicago, to succeed Mr. Keefers. W. S. Benson, Traveling Freight Agent, has been appointed Assistant General Freight Agent with office at Dubuque.

Kansas City, Clinton & Springfield.—The following directors have been elected for the ensuing year: George H. Nettleton, J. S. Ford, Wallace Pratt, J. H. Emmert, W. A. Fagan, I. P. Dana, E. S. Washburne, W. J. Ferry and W. E. Dunn.

Kansas City, Fort Scott & Memphis.—The annual meeting was held at Kansas City March 9. About 80,000 shares were represented and the following directors were elected: H. H. Hunnewell, Nathaniel Thayer, Charles Merriam, E. V. R. Thayer, T. Jefferson Coolidge, Francis Bartlett, B. P. Cheney, Abbott Lawrence, John A. Burnham, George H. Nettleton, C. W. Blair, O. E. Learnard and B. B. McDonald.

Kansas City, Fort Smith & Southern.—New officers were elected at a meeting of the Directors at Neosho, Mo., March 9. The only change made was the election of a new President, J. B. Stevenson, Jr., of Philadelphia, heretofore reported as B. Stevens.

Kentucky & Indiana Bridge Co.—J. C. Pullman, Freight Agent of the Louisville Southern, at Louisville, has been appointed General Freight Agent to succeed R. E. Parsons, resigned.

Louisville, New Albany & Chicago.—The annual meeting, called for March 10, has been adjourned until September. The following directors were elected for the Bedford & Bloomfield, and the Orleans, West Baden & French Lick: John Greenough, Samuel Thomas, Eugene Hawkins, Calvin S. Brice, all of New York; W. H. McDoel and Gilbert Shaw, of Chicago, and H. H. Campbell, of Boston.

Louisville, New Orleans & Texas.—W. F. King, formerly of the Chesapeake & Ohio at Cincinnati, has been appointed Superintendent of the New Orleans Division, with headquarters at New Orleans. G. D. Lawrence, whose jurisdiction has heretofore included that division, will continue as Superintendent of the Natchez & Jackson Division, with headquarters at Vicksburg, Miss.

Meriden, Waterbury & Connecticut River.—The directors have elected David S. Plume, of Waterbury, Conn., a director and Vice-President of the company. Mr. Plume is also a director of the New York & New England road.

Metropolitan West Side Elevated (Chicago).—E. J. Harkness, Hermann Benzl, John H. Glade, John Worthy and Wm. W. Gurley, all of Chicago, have filed articles of incorporation for this company in Illinois.

Mexican National.—Theo. P. Jacobs has been appointed Master Mechanic of the Toluca & Acambara subdivisions, including the Patzcuaro branch, with headquarters at Acambaro, Mex. L. H. Sherman will remain in charge of the Mexico subdivision and El Salto branch. James Tobin has been appointed Foreman at Saltillo Terminal, Mex., vice D. F. Drennan, resigned.

Missouri Pacific.—At a meeting of the Board of Directors of the company in New York, March 16, the following officers were elected: President, Jay Gould; First Vice-President, S. H. H. Clark; Second Vice-President, George J. Gould; Assistant General Manager, George C. Smith; Secretary and Treasurer, A. H. Calef; Assistant Secretary, Harry Phillips; Second Assistant Secretary, F. W. Irland.

Montreal & Sorel.—The annual general meeting of the shareholders was held last week, at which the following were elected as directors. C. N. Armstrong, G. T. Tunrbull, R. Prefontaine, M. S. Lonergan and L. G. J. Fossbrooke. The following officers were appointed: C. N. Armstrong, President: G. T. Turnbull, Vice-President, and Robert Watson, Secretary-Treasurer.

Newport.—The Newport Railroad Hotel and Land Improvement Co., incorporated in Virginia this year, has organized with John C. Robertson, President; Manning C. Staples, Vice-President, and William Marshall, Secretary. The office of the company is 1104½ East Main street, Richmond, Va.

Newport News & Mississippi Valley Co.—The abrogation of the traffic agreement between this company and the Louisville, New Orleans & Texas road does not affect the positions of more than a few of the traffic officers, and that department will continue in charge of E. W. How, Traffic Manager, with headquarters at Memphis.

Norfolk & Western.—This company having assumed control of the Lynchburg & Durham Railroad and of the Roanoke & Southern Railroad, the following additional subdivisions have been established: Eastern General Division, Durham Division, Lynchburg, Va., to Durham, N. C., office at Lynchburg, Va., Theodore Low appointed Superintendent: Western General Division, Winston-Salem Division, Roanoke, Va., to Winston, N. C., office at Winston-Salem, N. C., D. H. Barger, appointed Superintendent.

Pennsylvania.—The committee appointed in pursuance of a resolution adopted by the stockholders at their annual meeting to recommend a ticket for directors has named the present directors, as follows: George B. Roberts, Alexander M. Fox, Alexander Biddle, N. Parker Shortridge, Henry D. Welsh, William L. Elkins, H. H. Houston, A. J. Cassatt, C. A. Griscom, B. B. Comegys, Amos R. Little, William H. Barnes, George Wood.

Philadelphia & Reading.—A number of changes in the operating and traffic department were announced this week. The only important changes are the appoint-

ment of I. G. Swergard to be Assistant General Manager and of M. F. Bonzano to succeed him as General Superintendent. The following general divisions have been established: Main line division—M. F. Bonzano, General Superintendent, office at No. 227 South Fourth street, Philadelphia. Williamsport division—C. M. Lawler, General Superintendent, office at Williamsport, Pa. Eastern division—H. Stanley Goodwin, General Eastern Superintendent, office at Bethlehem, Pa. Northern division—William Stevenson, General Northern Superintendent, office at Sayre, Pa. C. G. Hancock, General Passenger Agent of the Central of New Jersey, has been appointed General Passenger Agent of the Port Reading, and has made the following appointments: E. B. Byington, General Western Passenger Agent, with office at Main and Seneca streets, Buffalo, N. Y.; A. W. Nonnemacher, Assistant General Passenger Agent, Eastern and Northern Divisions, with office at Bethlehem, Penn.; H. P. Baldwin, appointed Assistant General Passenger Agent, with office at 143 Liberty street, New York.

Pittsburgh & Lake Erie.—F. E. House, who has been an engineer in the maintenance of way department on the Lake Shore & Michigan Southern at Dunkirk, N. Y., has been appointed Engineer of Maintenance of Way of this road, with headquarters at Pittsburgh. This is a new department, that work having been heretofore included in the duties of G. H. Carr, Superintendent of Construction.

Queen & Crescent.—J. G. Tomlinson, who has been Master Mechanic of the Alabama Great Southern Division for the last five years, has been transferred to the Alabama & Vicksburg and New Orleans & Northeastern Divisions as Master Mechanic, with headquarters at Meridian, Miss.; J. C. McCarthy, Master Mechanic at Meridian, has been transferred to the Vicksburg, Shreveport & Pacific Division as Master Mechanic, with headquarters at Monroe, La. He succeeds J. P. McCuen, who has been appointed Master Mechanic of the Alabama Great Southern Division, with headquarters at Birmingham, Ala.

Richmond & Danville.—Edward Q. Cordner has been appointed Eastern Passenger Agent, with headquarters at 229 Broadway, New York, to succeed W. H. Taylor, transferred. Mr. Cordner was formerly Southeastern Passenger Agent of the Pennsylvania.

Richmond & West Point Terminal.—The directors of the company have appointed the following Executive Committee: President, J. H. Inman; Vice-President, T. M. Logan; George J. Gould, Samuel Thomas, James Swann, J. C. Maben, W. E. Strong, Calvin S. Brice and John G. Moore.

St. Louis & Hannibal.—At the annual meeting of the stockholders of the St. Louis & Hannibal and St. Louis, Hannibal & Kansas City roads, at Hannibal, Mo., March 10, the following directors were elected: J. L. Blair, D. C. Blair, S. S. Palmer, Mart Cox, James P. Wood, John C. Wood, John C. Thurman and J. H. Orr. The following officers were elected: President, John L. Blair; Vice-President, J. H. Orr; Secretary and Treasurer, S. S. Palmer; General Passenger and Freight Agent W. W. Driggs.

St. Louis & Superior Terminal.—The following are now the officers of this company and of the St. Louis Railway Co.: N. J. Upham, President; J. D. Stryker, Treasurer; A. C. Otis, Secretary, and C. E. Burrell, Chief Engineer, all of Duluth, Minn.

St. Regis & Salmon River.—The directors are John C. Yager, Frank G. Smith, Arthur G. Godfrey, Charles H. Burnett, James Fagan, William L. Carden, Arthur G. Leonard, Cassander D. Flagg and C. R. Wager, all of New York City.

Savannah, Florida & Western.—At the recent annual meeting in Savannah last week, the following directors were elected: H. B. Plant, B. F. Newcomer, H. M. Flagler, Henry Sanford, M. K. Jessup, H. S. Haines and J. H. Estill. At the meeting of the directors the following officers were re-elected: President, H. B. Plant; Vice-President, H. S. Haines; Secretary, R. B. Smith, and Treasurer, J. M. Lee.

West Virginia Central & Pittsburgh.—William H. Bower, who has been in the employ of the Pennsylvania at Bedford, Pa., for the past five years, has resigned to accept the position of Assistant General Manager of this road with headquarters at Cumberland, Md.

RAILROAD CONSTRUCTION, Incorporations, Surveys, Etc.

Alabama & Mississippi.—The survey will begin in a few days at Pickensville, Ala., for this road, which has been organized by J. R. Long, of Pickensville, Ala., C. W. Mills, of Columbus, Miss., and others. The line will extend from Columbus, on the Georgia Pacific, southeast about 20 miles to Pickensville, Ala., in the western part of Pickens County. C. E. Rodenberg, of Columbus, is President.

Brantford & Tilsonburg.—This company is applying to the Ontario Legislature for a subsidy to extend the road to Port Burwell, Ont., on Lake Erie. Aid has been promised from the Dominion Government, and if Ontario also assists it is said the Grand Trunk will build and operate the extension.

Canada Western.—It is understood that the Directors who secured the charter for building this British Columbia line have been negotiating with a number of Eastern capitalists for the building of the line from the eastern boundary via Bute Inlet and Seymour Narrows to Victoria, B. C. It is intended to expend the sum of $30,000 this year in connection with the preliminary surveys which are to be made. It is stated that the question of renewing the land grant and charter will be considered at the present session of the legislature.

Canadian Roads.—The Winnipeg, Selkirk & Southeastern has applied to the Canadian Parliament for an act extending the time for completing its road, and the Lindsay, Bobcaygeon & Pontypool has applied for a similar act, and also to reduce the capital stock, and for power to extend the proposed line from Bobcaygeon through Galway to a junction with the Irondale, Bancroft & Ottawa at Irondale, Ont.

Chicago, Greenville & Southern.—The company has been incorporated for the purpose of building a railroad to commence at a point on the Jacksonville, Louisville & St. Louis road in Bond County, Ill., and to extend through the counties of Bond, Clinton, Washington, Perry and Jackson to Murphysborough, Ill. The capital stock is $1,000,000.

Chihuahua & Eastern.—It is proposed to build this road from the terminus of the Mexican Northern Railroad, at the Sierra Mojada Mountains, westward through the State of Chihuahua, in Mexico, to the Jaco salt lakes, which are owned by a Scotch syndicate, which will also build the railroad, under the management of a Mr. Dickey. The officers are reported to be receiving bids for the construction material for 60 miles toward the Jaco salt lakes. Thomas McManus, of Chihuahua, Mex., is one of the directors.

Columbus & Sandusky Short Line.—About $500,000 is reported to have been subscribed recently by the business men of Columbus, O., to the capital stock of this company insuring the commencement of construction in April, as proposed some time ago. The new line will be practically controlled by the Columbus, Shawnee & Hocking, and, as already reported, will extend from Sandusky south through Bucyrus and Marion to Columbus, O., about 110 miles.

Concord Southern.—The organization of this company has just been completed and an election has been ordered for Concord, N. C., which has been asked to issue about $75,000 of bonds to aid in the construction of the line. It is proposed to build from Concord, on the Richmond & Danville, south through Cebarrus County toward Monroe, N. C.

Duluth, Mississippi & Northern.—The contract for building this line from a point on the Mississippi River 40 miles east of La Prairie, Minn., due north 36 miles, has been let to Grant, Foley Brothers & Guthrie, of St. Paul. For the present it will be used as a logging road, but will ultimately be extended to the Mesaba iron fields. The sub contracts have already been let.

Eagle's Mere.—This road is now being built from Sonestown, Pa., and it is expected that the construction work will be completed in a short time. The company was incorporated last September and is building a narrow gauge road seven miles in length from a point on the Williamsport & North Branch road at Sonestown, which is about 10 miles east of Nordmont, north through Sullivan County to the village of Eagle's Mere. When the line is completed it will probably be operated in connection with the Williamsport & North Branch.

Great Northern.—This company is applying to the Dominion Parliament for an act to extend the time for the completion of its line in Quebec, to better define its location, to empower its consolidation with other roads, to authorize the construction of a railroad bridge across the Ottawa River at Grenville, Que., and the continuation of its line directly thereto.

Houston Belt & Magnolia Park.—The extension of this line to Harrisburg, Tex., will probably be begun in April and the work completed in July. The construction of the line, however, will depend upon the outcome of litigation, which it is expected will be decided this month, the line being now in the control of a receiver. The extension will be about a mile long and the road will be six miles long, extending from Main street, in Houston, Tex., via Magnolia Park to Harrisburg.

Kansas City, Watkins & Gulf.—About 33 miles of track had been laid this year on the Alexandria extension of this road up to March 9, and the contractors expect to complete the tracklaying into Alexandria, La., in three weeks. All the material for completing the work is now on the ground and about 125 men are laying the track. The line now being built is 100 miles long, and extends from Lake Charles, in southern Louisiana, northeast to a connection with the Texas & Pacific at Alexandria. J. B. Watkins, 2 Wall street, New York City, is the President, and P. H. Philbrick, of Lake Charles, La., is the Chief Engineer.

Los Angeles Terminal.—The surveys for the extension north of Los Angeles, Cal., have been made for about 20 miles up the San Fernando Valley. Nothing beyond a preliminary line has been run and no right of way has yet been secured. The officers state that the company will build the extension if sufficient subsidies are granted. There are no towns on the line which has been surveyed, but it has very easy grades. About a mile of trestling will be necessary at one point in the valley.

Manitoba Northwestern.—This company is applying to the Manitoba Legislature for power to construct a line from a point on the Great Northwest Central road northwest about 30 miles to the town of Birtle, in the western part of Manitoba, on the Manitoba & Northwestern road.

Manitoba & Southeastern.—A special general meeting will be held at Winnipeg, April 11, for the purpose of authorizing the issue of bonds of the company, to the amount of $15,000 per mile, for the purpose of raising money for prosecuting the construction to St. Anne, Man., about 60 miles.

Marmora & Crow Lake.—The projectors of this new road are talking of continuing the line to the junction near Huntington, Ont., where the Grand Trunk crosses the Central Ontario, and thence westward to Campbellford and through the County to Coburg, on Lake Ontario, about 40 miles.

Metropolitan West Side Elevated.—This company has been incorporated in Illinois to build an elevated road from the business portion of the city with three or four branches on the West Side. The promoters of this scheme are said to be the same that have brought the "Alley" road so near completion; for this reason the Chicago public feels encouraged that she West Side road will be built. An ordinance will be introduced in the city council at its next meeting for permission to build as follows: From Fifth avenue at a point between Jackson and Harrison streets west to the city limits with a branch to the south starting near Ashland boulevard to Eighteenth and Twenty-second streets, thence west to the city limits, also a north branch from Ashland boulevard to Milwaukee avenue, thence westerly to the city limits. The company is capitalized for $15,000,000 and it is understood that the construction will be commenced immediately after the ordinance is granted. If this line is carried out, it will provide Chicago with a system of elevated roads and rapid transit covering almost completely the portions of the city that are now being rapidly built up.

Mexican Central.—The tracklaying on the Pachuca extension was completed into Pachuca, Mexico, last week, and the line will probably be opened for regular traffic between Tula on the main line and Pachuca, 44 miles, early in April.

Mexican Roads.—It is expected that the railroad now building between Campeche and Mérida, Mex., will be opened for traffic as far as Tenobo within a few weeks, and that it will be completed to Hecelchaken by next August.

A project is being earnestly considered to build a road from Guadalajara to Tequila, in the state of Jalisco, a town 64 kilometres distant.

Minneapolis & St. Louis.—The company will double track eight miles of its line between Kenwood and Hopkins, Minn.

Mount Forest & Meaford.—Active steps are now being taken to secure the early construction of this road, which is to extend from Mount Forest north to Meaford, Ont., on Georgian Bay. Both towns are on the Grand Trunk, and the length of the line is about 40 miles. Among the projectors are: J. J. Johnson and W. R. Evans, Meaford, W. J. Mararlane, of Markdale, Ont.; J. H. Brown, of Durham, Ont., and Gilbert McKechnie and J. J. Riejerds, Rocklyn, Ont.

National Tehauntepec.—The new contract between the Mexican Government and Messrs. E. L. Corthell, J. A. Hampson and Hon. Chandos Stanhope for the completion of this road was noted last week. On the 9th of March an outfit of men was to leave Vera Cruz by steamer for Tehauntepec, to work on the road. Construction will be resumed at once. It is said that there is about 50 kilometres of heavy clearing to do, 105 kilometres to grade and 150 kilometres of track to lay. The contractors have undertaken to carry through the work in 15 months. B. D. Smith will have charge of the work.

Nevada, California & Oregon.—The engineers are to begin a survey in a few days for the extension of this line north of Amadee, Cal. The line will be run northwest through Plumas County toward Beckwith Pass. The line now in operation extends from Reno, Nev., north for a distance of 80 miles.

New Roads.—A. C. Arthur, of Middlesborough, Ky., is organizing a company to build a road from Careyville up Powell's Valley to the Big Creek Gap coal fields and to Arthur, connecting with the Knoxville, Cumberland Gap & Louisville. Another road commencing at East Cumberland Gap and extending to Johnson City or South Watauga is also proposed.

Ottawa, Arnproir & Parry Sound.—George A. Mountain, Chief Engineer, is preparing a report on the line surveyed through the Nippissing district in Ontario. The estimates will be finished this month, and until then no exact account of the possibilities of the projected line can be obtained. Mr. Mountain, however, states that his report will be a very favorable one, and he has no doubt that the construction of the line will be begun in the spring. It will be built as an extension of the Canada Atlantic, extending west from Ottawa to Elmsdale, Ont., on the Grand Trunk, the eastern terminus of the Parry Sound Colonization road.

Ottawa & Gatineau Valley.—Work was commenced last week on the construction of the fourth section of the Gatineau Valley line. This section covers 10 miles beyond the present terminus, north of Wakefield, Que., along the Ottawa River.

Peninsular of Lower California.—It is reported that the two surveying parties working between San Diego and San Quintin, Mex., will meet shortly. The big fill at San Quintin is nearing completion, and as soon as it is finished the tracklaying on the 20 miles already graded will be commenced. After finishing the survey of the route between San Diego and San Quintin, which, it is estimated, will take about three months, the survey for the line to Yuma, Ariz., will begin.

Port Arthur, Duluth & Western.—The road from Port Arthur, Ont., to the iron mines at the northern Minnesota line is now built to North Lake, a distance of 60 miles. Fifteen additional miles, on which track will be laid in the spring, will bring the line to the American boundary and within five miles of the iron deposits. It is claimed that the mines are 20 miles nearer a lake port via this Canadian line than via the American route.

Rochester & Honeoye Valley.—The track on this road, the extension of the Lehigh Valley into Rochester, N. Y., has been laid with the exception of 2¼ miles near Red Creek. It will be completed before the opening of the Buffalo division of the railroad.

St. Catherines & Niagara Central.—The projectors of this road speak hopefully of its early completion. Dr. L. S. Oille, the President of the company, says that the road will shortly be extended from St. Catherines west to Hamilton, Ont.

St. Louis & East St. Louis Terminal.—This company has filed articles of incorporation with the Secretary of the State of Missouri. It is proposed to construct or lease a road from a point in East St. Louis to a connection with the roads built to East St. Louis and Madison. The principal office is to be at Jacksonville, and the capital stock is $500,000.

St. Louis & Superior Terminal.—About three miles of grading has been completed on the section between St. Louis township and Walbridge, Wis., on the Northern Pacific. The contracts were let last fall for other construction work on the line, and some grading has been done between North St. Louis and Superior, but it is not likely that any part of the road will be completed this year. The company was organized last year to build about 27 miles of road from St. Louis township to Duluth and Superior. Three lines have been surveyed from St. Louis, one to Superior, 10 miles, to a point on the Northern Pacific, three miles, and to Duluth, 14 miles. Two companies have been organized, one the St. Louis & Superior Terminal, and the other the St. Louis Railway Co.

St. Regis & Salmon River.—This company has been incorporated in New York with a capital of $2,500,000 to construct a road from a point on the New York & Northeastern Railroad near Tupper's Lake, Franklin County, northerly to intersect the Malone & St. Lawrence road near Malone. A branch road will extend from the main line to Saranac Lake and other towns in Franklin County. The road will be about 70 miles in length, and is apparently to be built as a branch of the Adirondack & St. Lawrence.

Springfield, Pawnee & Southern.—Articles of incorporation have been issued by the Secretary of State at Springfield, Ill., for this road. It is proposed to build a line from Springfield south to Pickneyville, through the counties of Christian, Montgomery, Bond, Clinton and Washington. It is said that arrangements have been completed to build this summer through Hillsboro, Smithboro, Carlyle and Nashville.

Springfield, Yellville & White River.—A preliminary survey has been made for about 50 miles southeast of Yellville, Ark., and as soon as this portion of the route has been cross sectioned the survey will be resumed from the present terminus. The projectors ex-

pect to commence actual work within the next two months. The company has been organized to build a line about 225 miles long, from Yellville southeast along the White River, through Arkansas, to a point on the Mississippi River. The President of the company is Edward H. Webster, and the Chief Engineer is D. W. Pike, of Kansas City, Mo.

Victoria & Sidney.—Julius Brethour, Robert Irving and Henry Brethour are the promotors af a bill to incorporate a company to construct a railroad from Victoria to Sidney, B. C. The company proposes to begin construction before May, 1893, and complete the road in the same year.

Wilkesbarre & Eastern.—The surveys have been partly made for the route east of Williamsport, Pa., and the company, which was only incorporated last week, expects to have the location made and all the work for letting the contracts completed during April. The road will be about 57 miles long, crossing the Susquehanna River at Wilkesbarre and extending southeast to Stroudsburg and the Delaware River, connecting with the Delaware, Lackawanna & Western. It will extend through Gateaville and Ash Gap and cross the Moosic mountains. W. P. Ryman, of Wilkesbarre, is President.

GENERAL RAILROAD NEWS.

Canadian Pacific.—This company is applying to the Dominion Parliament for power to issue, in addition to that already authorized, consolidated debenture stock in exchange for mortgage bonds, such bonds to be retained by the company as security of holders of consolidated debenture stock.

Chattanooga Southern.—The reorganization committee announces that a majority of the first mortgage bonds of the company has been deposited with the Atlantic Trust Co., of New York under the reorganization agreement of Feb. 1, and the plan of reorganization as therein set forth has been declared effective. The committee comprises H. A. V. Post, Russell Sage, Walter Stanton, Henry L. Lamb and Newman Erb.

Chicago, Milwaukee & St. Paul.—The directors declared the regular dividend of 3½ per cent. on the preferred stock last week, but no dividend was declared on the common stock. Rumors had been published for several weeks that dividends on the common stock, which have not been paid since 1888, were to be resumed this month. The following statement was made in explanation: "The board deemed it not advisable to begin payments of dividends on the common stock from earnings of the first half of the current fiscal year, which were exceptionally large. At the close of the year on June 30, the accounts will show the results of the year's business, and the board will then have information as to the condition of the crops and probable earnings of the year to come, so that in resuming dividends an intelligent opinion can be formed as to what rate can safely be paid with reasonable assurances of its continuance."

Cincinnati, Jackson & Mackinaw.—The reorganization committee completed a plan last week for the organization of a new company under the same title, to succeed the one recently sold at foreclosure sale. The charter for the new company was filed in Ohio and Michigan March 9. The capital stock is $16,300,000.

Denver & Rio Grande.—The United States Supreme Court has affirmed the judgment of the Colorado Circuit Court in the case involving the right of the Chicago, Rock Island & Pacific to use the terminal facilities of the Denver & Rio Grande at Denver, for Union Pacific business. The companies had a contract with respect to a short line from Colorado Springs and the Rock Island subsequently entered into a traffic agreement with the Union Pacific and sought to use the Denver & Rio Grande terminal facilities. The contention of the Denver & Rio Grande against such use of its terminals was sustained.

East Line & Red River.—The receivership has been continued and the Receiver authorized to issue $400,000 of certificates to begin the standard gauging of the road between Jefferson ond Greenville, Tex., 125 miles. The court, at the request of all parties to the recent foreclosure suit, has deferred the consideration of the request to approve the sale to Henry W. Poor, of New York, Trustee.

Green Bay, Winona & St. Paul.—The Reorganization Committee proposes to issue the following new securities for the purposes of reorganization: $2,500,000 consolidated 5 per cent. mortgage bonds, due in 1911; also $3,781,000 second mortgage 4 per cent. non-cumulative income bonds, due in 1906; also $2,000,000 non-cumulative preferred stock, and $8,000,000 common stock. The consolidated mortgage bonds will be issued to take up the present first mortgage bonds, $1,000,000, and unpaid interest coupons, leaving $157,720 in the treasury for improvements.

Illinois Central.—The earnings for the seven months ended Jan. 31, 1892, and 1891, are reported as follows:

	1892.	1891.	Inc. or Dec.
Miles operated	2,884	2,875	I. 9
Gross earnings	$11,680,445	$10,836,444	I. $844,001
Oper. expen. and taxes	8,227,520	7,924,984	I. 902,536
Net earnings	$3,452,925	$3,511,460	D. $58,535

The gross receipts from traffic for the month of February, 1892, are estimated at $1,526,082 and for February, 1891, the receipts were $1,408,310, an estimated increase in 1892 of $117,772.

Interstate Consolidated Rapid Transit.—The Metropolitan Trust Co., of New York, has been granted a decree of foreclosure for the sale of this road, which is an elevated and cable line at Kansas City, about eight miles long. The decree was issued on three mortgages executed in 1886, 1887 and 1888, aggregating about $2,000,000, which were issued during the construction of the road.

New York Central & Hudson River.—The earnings for the quarter ending March 31 are as follows, the figures for 1892 being partly estimated:

	1892.	1891.	Inc.
Gross earn	$10,857,275	$8,968,175	$1,839,100
Oper. expen	7,496,244	5,975,439	1,460,805
Net earn	$3,301,031	$3,012,736	$378,295
Fixed charges	2,479,121	2,184,850	294,271
Profit	$911,910	$827,886	$84,024
Dividend	$1,117,854	894,283	223,571
Deficit	$205,944	$66,397	$139,547

The statement for the nine months to March 31 is as follows:

	1892.	1891.	Inc.
Gross earn	$34,980,893	$27,514,866	$7,466,027
Oper. expen	23,141,193	18,498,943	4,942,250
Net earn	$11,539,700	$9,015,923	$2,523,777
Fixed charges	7,411,496	6,381,250	1,030,246
Profit	$4,128,204	$2,634,673	$1,493,531
Dividend	3,353,561	2,682,849	670,712
Surplus	$774,643	def. $48,176	$822,819

Philadelphia & Reading.—The Attorney-General of Pennsylvania filed a bill in equity at Harrisburg, last week, in the Court of Common Pleas of Dauphin County. The bill asks for a decision as to the legality of the leases of the Lehigh Valley and Central of New Jersey by the Philadelphia & Reading. The general ground taken is that the various roads concerned in the deal are parallel and competing lines, and that the leases and agreements whereby the deal was consummated are unconstitutional. The suit is brought before Judge Simonton, the same judge who heard the famous South Pennsylvania Railroad case.

The New Jersey Legislature has passed a special law relating to the leasing of railroads with special reference to the recent arrangement between this company or the Port Reading road and the Central of New Jersey, and intended to legalize that agreement.

President McLeod testified on Saturday before the special committee of the New York Legislature appointed to inquire into the nature of the agreements made between the companies. President Maxwell and Vice-President Baker, of the Central of New Jersey, have also testified before the committee.

Richmond & West Point Terminal.—The plan of reorganization for these properties, prepared by the Olcott committee, was made public on Wednesday last. The plan proposes a closer amalgamation of the roads in the system, the creation of a new company, to be called the Southern Railway Co., and the issue of $350,000,000 of new bonds. A syndicate of bankers has agreed to see that the necessary guarantee fund, amounting to $14,588,640 shall be raised. The plan ignores the Central of Georgia in its provisions, on account of the pending litigation. The Richmond & Danville and the East Tennessee, Virginia & Georgia systems, now controlled by the Terminal Co., are to be consolidated. The interest of the Terminal Co. in the Georgia Central will form part of the security for the new first-mortgage bonds. It is contemplated that there shall be an issue of four per cent. first-mortgage bonds to run 35 years, bearing interest from March, 1892, to the amount of $170,000,000, to be exchanged for the various existing securities. There will be new preferred five per cent. non-cumulative stock to the amount of $70,000,000 and $110,000,000 common stock, a total capitalization of $350,000,000, covering present securities amounting to $394,572,101, exclusive of car trusts. Provision is made for the retirement of the existing car trusts, amounting to $2,369,564, and the floating debts of the systems, amounting to $6,310,000. The present fixed charges, including car trusts, amount to $9,474,837, against net earnings last year of $8,741,736. When the proposed plan is carried out the fixed charges will be $6,400,000. Adding the rentals of the Cincinnati Southern ($1,000,000) and the North Carolina Railroad ($260,000), the total fixed charges will be $7,660,000. On the basis of previous earnings this would leave about $1,100,000 for dividends on the new five per cent. preferred stock. Under the plan the rights and interest of the East Tennessee, Virginia & Georgia in the securities of the Alabama Great Southern and the Cincinnati, New Orleans & Texas Pacific are to be subject to the lien of the new first mortgage. The discharge of the Richmond Terminal collateral trust six per cent. mortgage is to be deferred until the collateral deposited to secure bonds issued thereunder may, in the judgment of the reorganization committee, be directly subjected to the lien of the new first mortgage. Each holder of 100 shares of terminal stocks and of $1,000 collateral trust five per cent. bonds may subscribe $1,600 to the cash fund of $14,588,640, which is necessary to meet the cash requirements of the plan, each subscription carrying a right to $2,000 new four per cent. bonds and $700 new preferred stock. It is these subscriptions which the bankers' syndicate undertakes to guarantee.

Holders of the five per cent. collateral trust bonds and of the preferred and common stock may deposit their securities and become parties to the reorganization plan without subscribing to the $14,588,640 cash fund. The securities are to be deposited by April 14. The committee which has had the reorganization in charge consists of Frederic P. Olcott, President of the Central Trust Co.; Oliver H. Payne, Frederick D. Tappan, President of the Gallatin National Bank; William H. Perkins, President of the Bank of America, and Henry Budge, of Halgarten & Co. To the committee have been added H. C. Fahnestock and J. Kennedy Tod.

Wilmington & Weldon.—The Supreme Court of North Carolina has decided that all the branch roads built by this company are liable for taxation. The original charter of this road exempted the company from taxation so long as the profits did not reach eight per cent. of the capital stock.

TRAFFIC.

Chicago Traffic Matters.

CHICAGO, March 16, 1892.

It looks as though the roads would be obliged to settle the passenger commission question speedily, or else submit to a sweeping reduction in rates west of here. The Santa Fe persists in its assertion that it will make an open rate from the Missouri River to the Pacific coast of $14.30, a reduction of $20.70, on second class tickets, unless a satisfactory agreement is reached whereby it can get a share of the immigrant business. Such a reduction would reduce the rate from here to $24.30, and reduce all intermediate second class rates via all lines. Inasmuch as by far the larger proportion of the Pacific coast business is handled on second class tickets, it takes but a moment to figure out the enormous reduction in revenues which such a course would entail if applied to both intermediate and through traffic.

With the meeting of the Christian Endeavor Society in New York in July and the conclave of the Knights Templar at Denver in August there is likely to be considerable "scrapping" both East and West this summer. Already the Eastern lines are beginning to make faces at each other on account of the Christian Endeavor meeting. It is the old spook of differentials which appears and refuses to down. The trunk lines claim that if the differential lines are allowed to take the $2 differential on this business they will get it all, as it will be a class of travel that cares more for the $2 than the quicker time, and say that if the Grand Trunk, Erie and Baltimore & Ohio take the differential off the rate now established ($18, round trip) they will at once reduce to $16. In fact, it is reported that contracts have already been made at $16. As regards the Denver rates, it is not so probable that there will be much cutting, for the lines in Western Traffic Association territory are much beter in hand than those in Central Traffic and Trunk Line territory, and, judging from the past year, are much less likely to break loose than their neighbors on the east.

The reduced rates on fifth class in Kansas, as ordered by the Kansas Railroad Commissioners, will not take effect to-day, as was intended, for the reason that the Missouri River jobbers have secured an injunction against the Board of Commissioners and the railroads, restraining them from changing their rates. The petition on which a temporary injunction was granted by Judge Eaton at Atchison charges the Board of Commissioners with violating the statute of the state, grossly discriminating against Missouri River jobbers and in favor of jobbers at interior points, and that the enforcement of the order would work great damage and detriment.

Messrs. Barker, Caldwell and Edwards, as arbitrators, have made a report sustaining Chairman Finley, of the Western Passenger Association, in declining to entertain charges made against the Chicago, Milwaukee & St. Paul because of defective service in that a notice of alleged violation should have been given at the general offices in this city instead of at the office of the line at St. Paul. In the same case they reverse the decision of the chairman in sustaining the charge of false representation on the part of the Chicago, St. Paul, Minneapolis & Omaha.

The Freight Committee of the Central Traffic Association have authorized rates on articles of iron and steel manufacture between points in association territory on the basis of 17½ cents per 100 lbs., l. c. l., and 15 cents per 100 lbs., c. l., Pittsburgh to Chicago, effective March 28, but not to extend beyond Sept. 30, 1892.

Another conference is to be had between the Northwestern lines and the Canadian Pacific, March 21, in this city, to endeavor to reach an agreement in respect to an adjustment of second class rates and seaboard immigrant traffic from St. Lawrence ports to the Northwest.

The Commissioners of the Western Traffic Association have given notice of a session commencing March 22, at which they have docketed a large number of subjects, some of which are of considerable importance and others are minor matters of difference between the members.

Traffic Notes.

The Toledo Freight Inspection and Weighing Bureau saved over $12,000 in February. Over $11,000 of this was made by weighing carload lots.

The tourist (second class) sleeping car making weekly trips between Boston and Chicago over the Fitchburg and the Erie has been again put on. It was taken off Dec. 1.

The Interstate Commerce Commission is to hear complaints at Atlanta, Ga., on March 25 and 26; at Chattanooga, Tenn., on March 28, and at Nashville, Tenn., on March 30 and 31.

The trunk lines taking emigrants westward from New York have contracted with the Starin Transportation Co. for a regular steamboat between the immigrant landing station at Ellis Island and the stations of the various roads.

The Southern Railway & Steamship Association has revoked the rule by which shipments of grain, flour, etc., from the north, billed to Atlanta, could be rebilled to points further south or east and through rates from Cincinnati applied to the final destination.

Second class passenger fares between Buffalo and Chicago are disturbed, the New York, Chicago & St. Louis having made a slight reduction some weeks ago. The Grand Trunk and Wabash line has now made a rate of $9.50, the same as that quoted by the Nickel Plate and the Erie.

The restoration of passenger fares between Chicago and the principal points in Central Ohio, which has been agreed upon by the Baltimore & Ohio and the Pennsylvania, is objected to by the Columbus, Hocking Valley & Toledo, which, in connection with the Erie, takes some passengers between Columbus and Chicago, and that company announces that the reduced rate of $7.25 will be continued.

The California Traffic Association, of which Mr. J. S. Leeds is Manager, has made a formal demand upon the Railroad Commissioners of that State to reduce freight rates generally. The San Francisco *Chronicle* says, however, that "the Railroad Commision was elected by the Southern Pacific company, and will adopt just such rates as the Southern Pacific orders." The President of the Traffic Association has also published a vigorous attack on the Pacific Mail Steamship Co. for combining with the transcontinental railroads to keep up freight rates. It is asserted that the subsidy paid by the roads to the steamship company now amounts to $75,000 a month, or $900,000 a year.

Eastbound Freight Shipments.

The shipments of eastbound freight from Chicago by all the lines for the week ending March 12 amounted to 91,455 tons, against 100,592 tons during the preceding week, a decrease of 9,137 tons, and against 77,693 tons during the corresponding week of 1891, an increase of 13,762 tons. The proportions carried by each road were:

Roads.	Week to Mar. 12		Week to Mar. 5	
	Tons.	P. c.	Tons.	P. c.
Michigan Central	15,155	16.6	13,133	13.1
Wabash	11,603	12.7	11,114	11.0
Lake Shore & Michigan South.	11,353	12.9	13,786	13.7
Pitts., Ft. Wayne & Chicago	8,956	9.8	12,302	12.2
Pitts., Cin., Chicago & St. Louis	5,511	6.0	8,567	8.5
Baltimore & Ohio	6,000	6.6	6,095	6.1
Chicago & Grand Trunk	11,310	12.4	12,894	12.8
New York, Chic. & St. Louis	7,039	7.7	10,422	10.4
Chicago & Erie	10,869	11.9	8,658	8.6
Other lines	3,101	3.4	3,632	3.6
Total	91,455	100.0	100,592	100.0

The three Vanderbilt lines carried 41.4 per cent. while the two Pennsylvania lines 15.7 per cent.

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